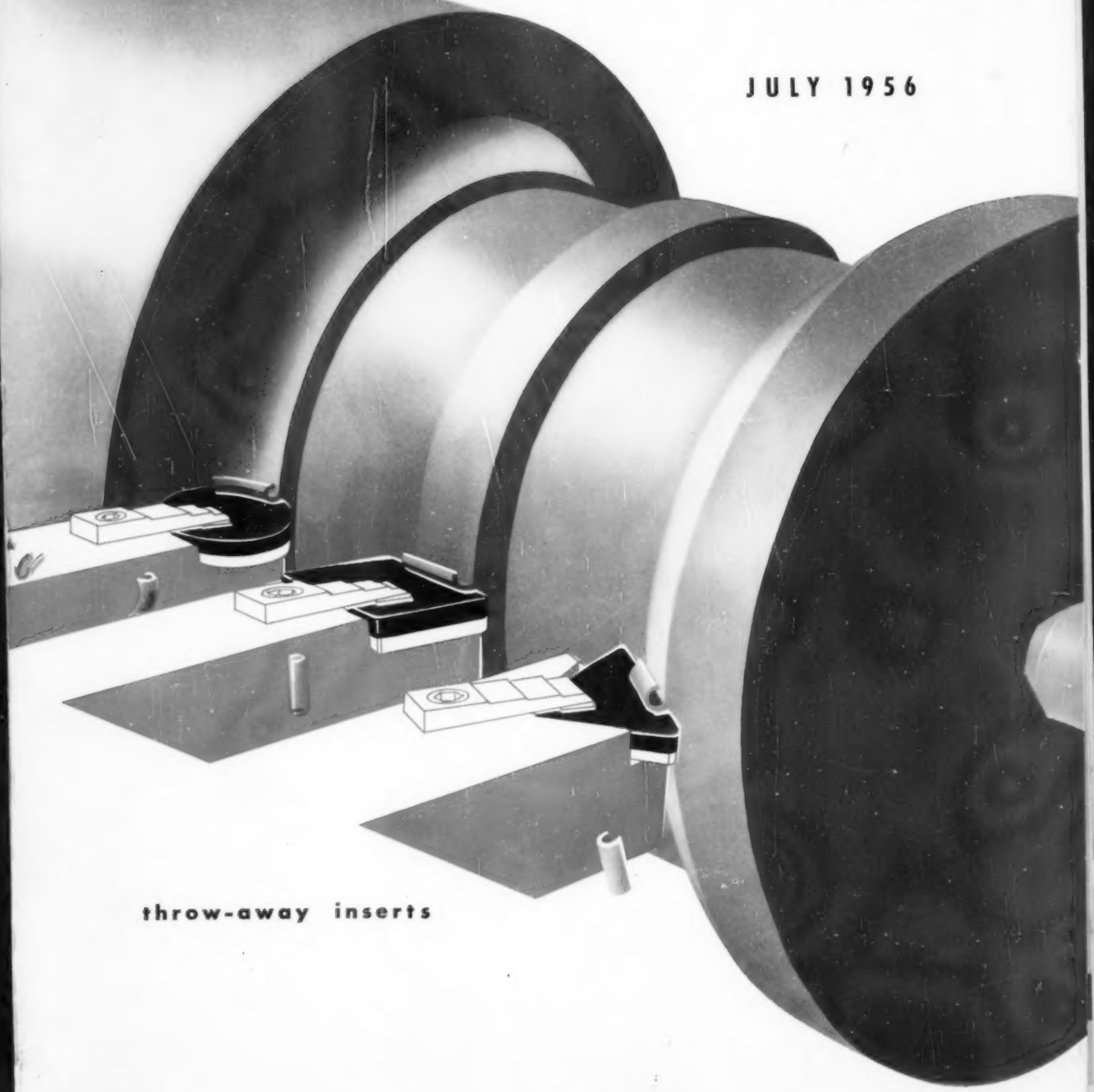
# the TOOL ENGINEER

JULY 1956



throw-away inserts

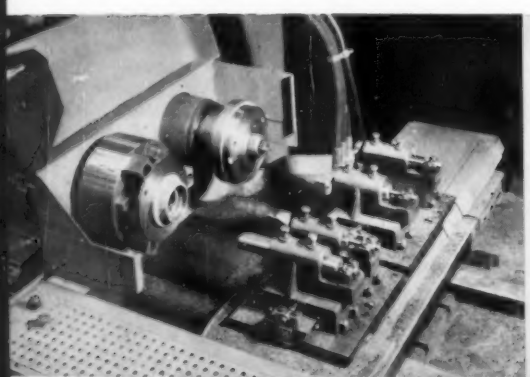
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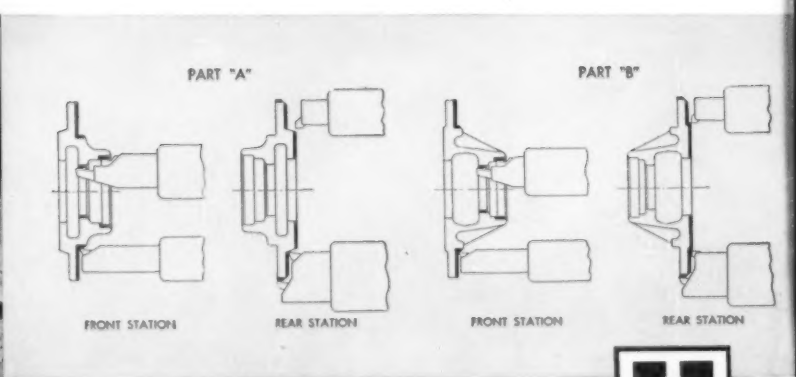
# The ability of Heald

# BORIZING* to

# combine operations and reduce handling time can make other precision finishing methods obsolete, regardless of age of equipment

**FOR EXAMPLE:** *This One Bore-Matic Replaced Two Older Machines and Increased Production more than 50%*






This new Heald Model 321 Bore-Matic performs combined boring, turning and facing operations on both ends of two different differential bearing carriers, as shown in the diagrams above. The job was formerly done in sequential operations on two separate machines, at a net production of 105 parts per hour. Borizing on this single-machine setup increased production to 166 parts per hour, with closer tolerances, better finish and much easier operation.

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COVER: Three typical throw-away carbide shapes — round, square and triangle —are shown simultaneously operating on a workpiece. Methods of setting up a throw-away insert tool programs are described in the article starting on page 73.

# The Tool Engineer

Volume XXXVII, No. 1 July 1956

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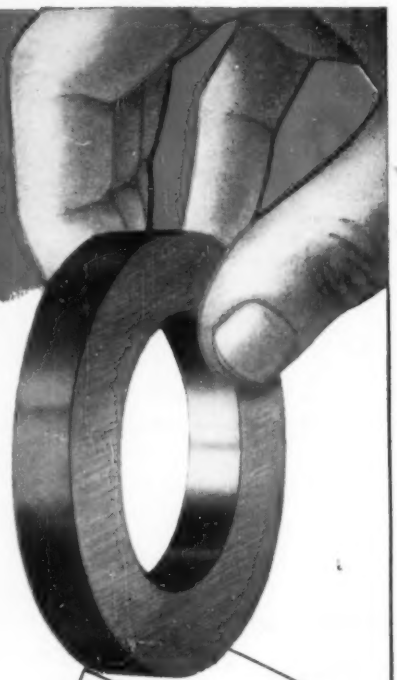

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# The Tool Engineer

## Operation and Maintenance

When production machines are more complicated, maintenance problems become compounded. Machines are not only performing more operations automatically with greater precision but are also being tied together in continuous lines. Unnecessary delays for repair of one unit in an integrated line cannot be tolerated.

Demands that all machine components be in the open, however, are not realistic when considering the over-all production picture. Motors, controls, hydraulic valves and tubing may require maintenance and should be accessible. Accessibility should not mean that these components must be hung on a machine like Christmas tree ornaments.

There are other aspects to consider. An externally mounted control can be a chip trap and interfere with operation. It can handicap the setup man, causing him to extend his reach more than should be necessary. The operator who must reach over a component that could be inside the base is wasting manpower.

There should be a practical compromise between operation and maintenance. If periodic visual inspection is made for maintenance, what is wrong with opening the door in a machine base?

Another approach is to encourage the development and design of foolproof equipment. Hydraulic fittings need not leak; pilot valves need not stick; electrical contacts need not fail. These are a matter of design and application. For a machine, however, it is necessary to select the best equipment available for the job and to strike a balance between operation and maintenance. Neither should have an advantage at the expense of the other.

John W Greve

EDITOR

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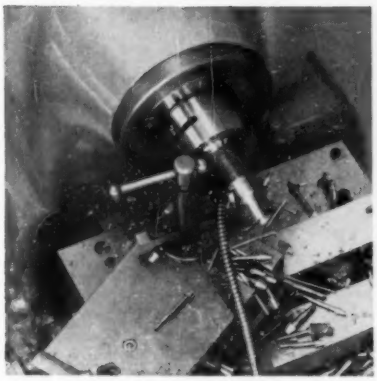
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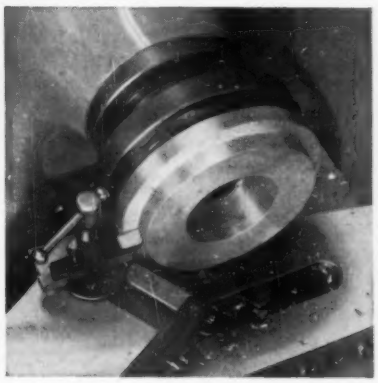
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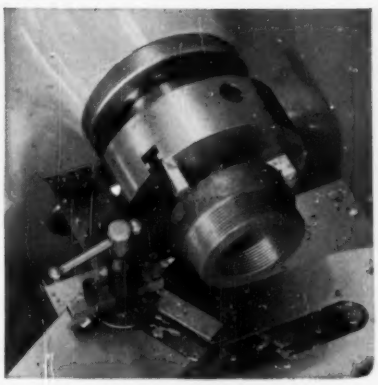
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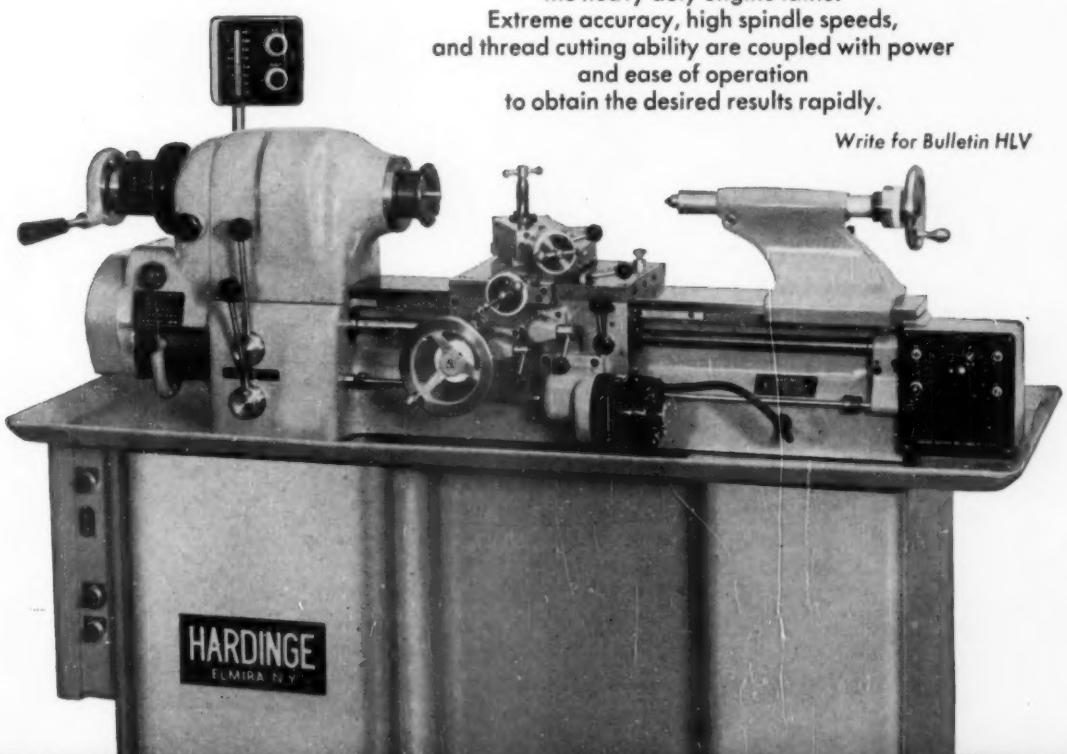
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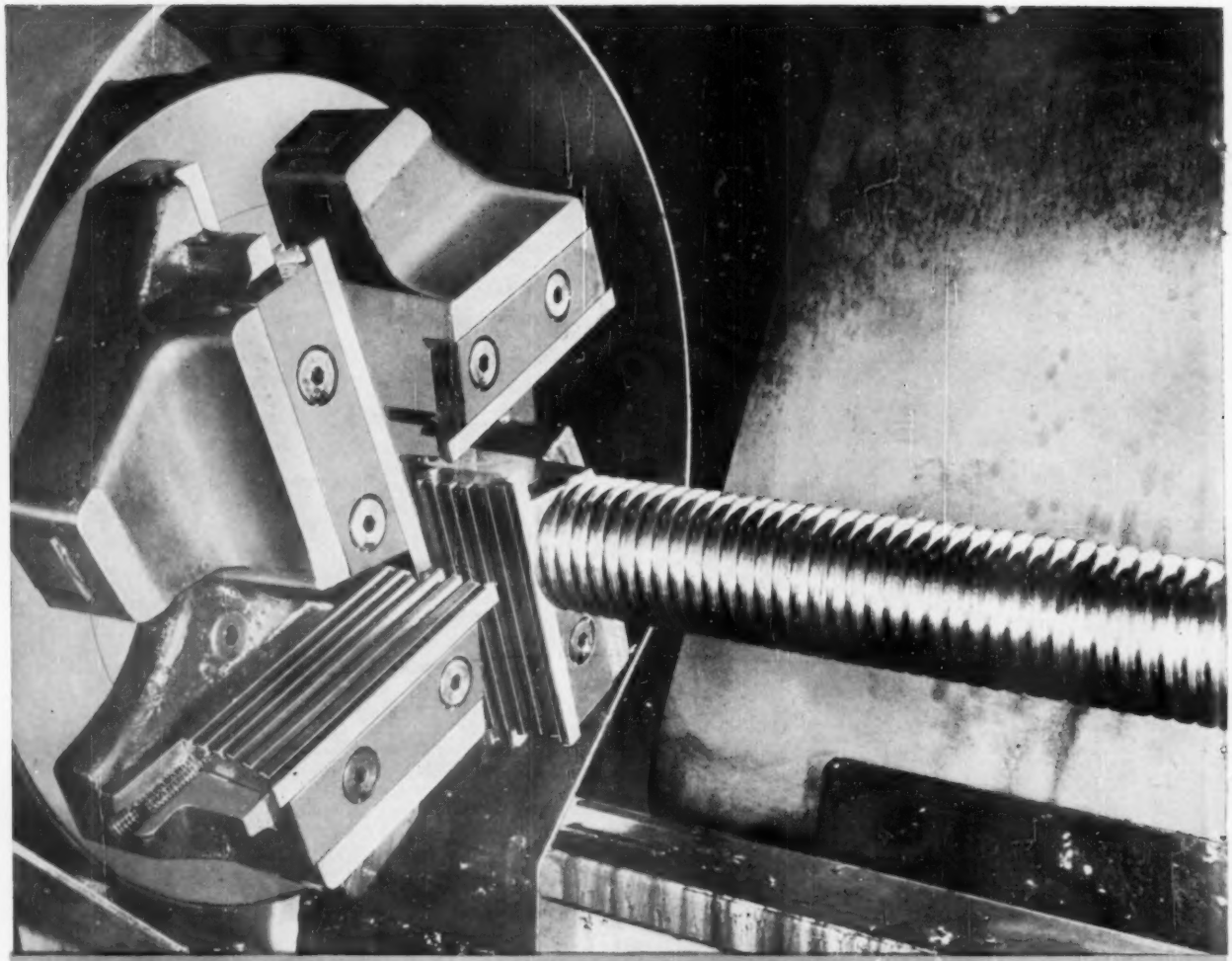
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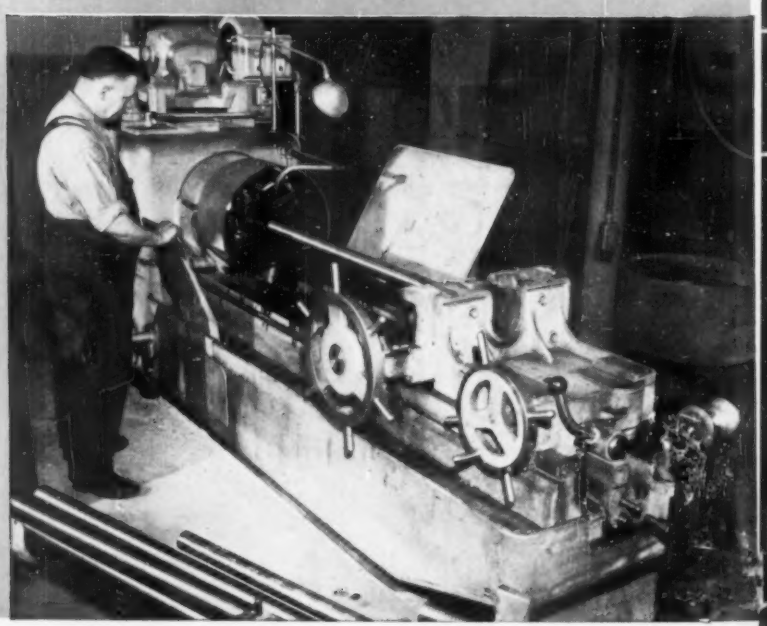



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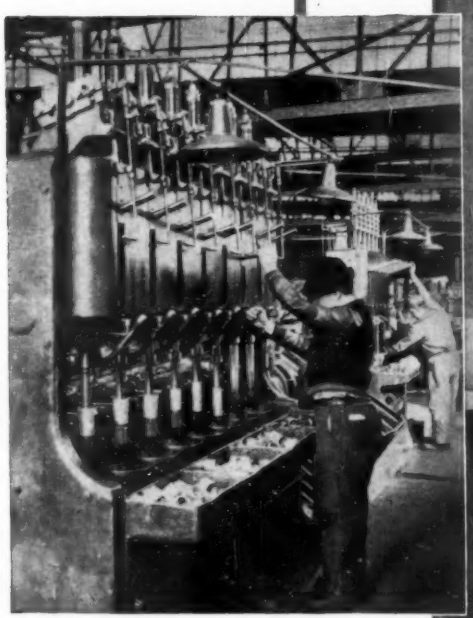
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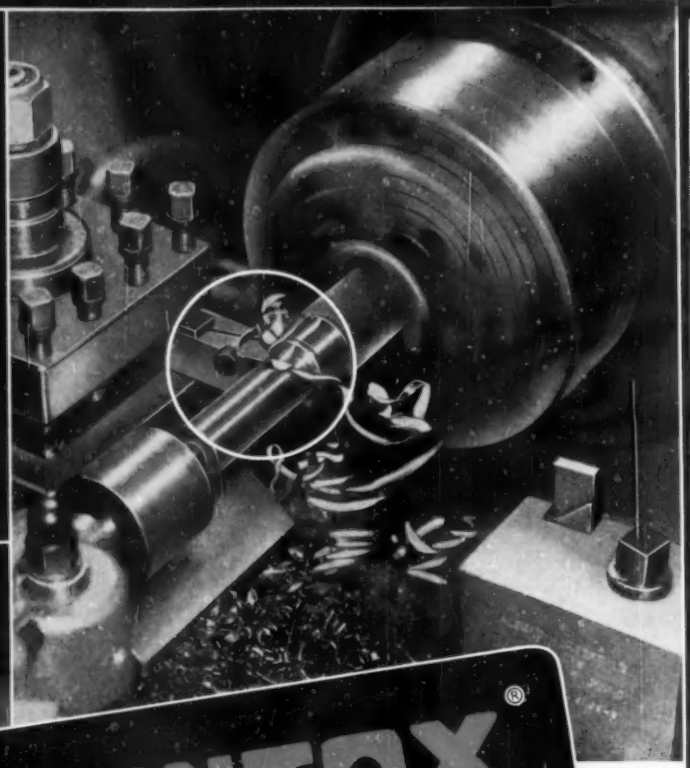
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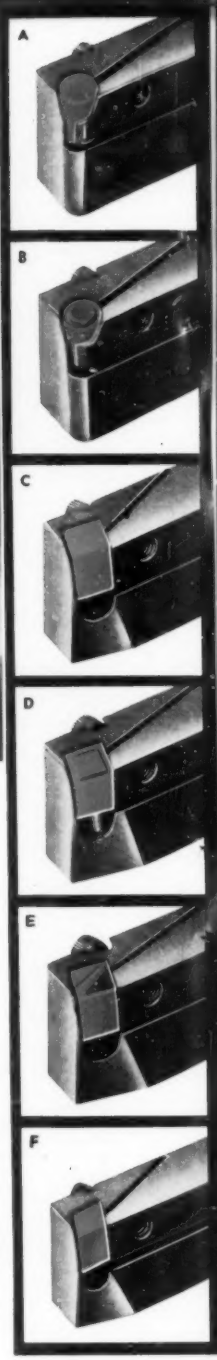
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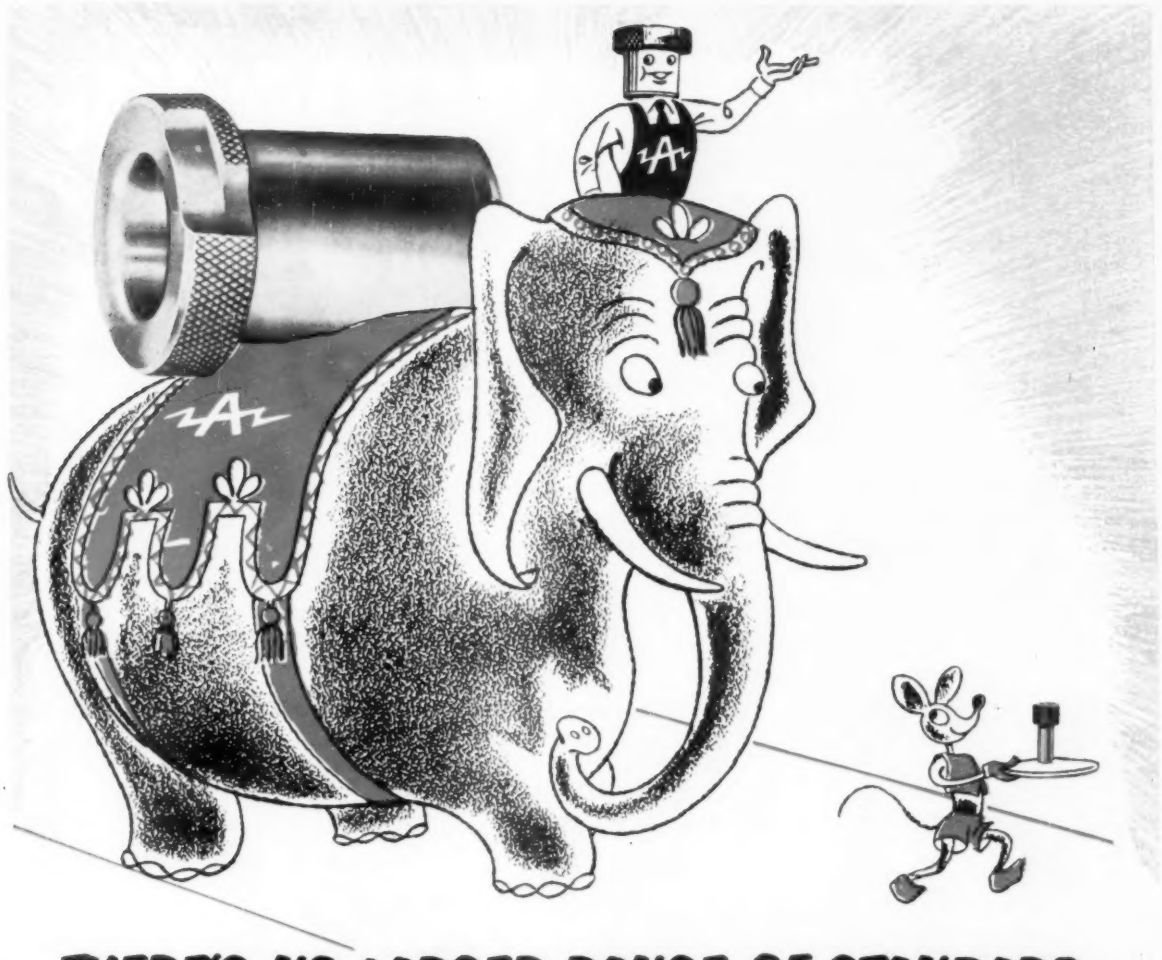
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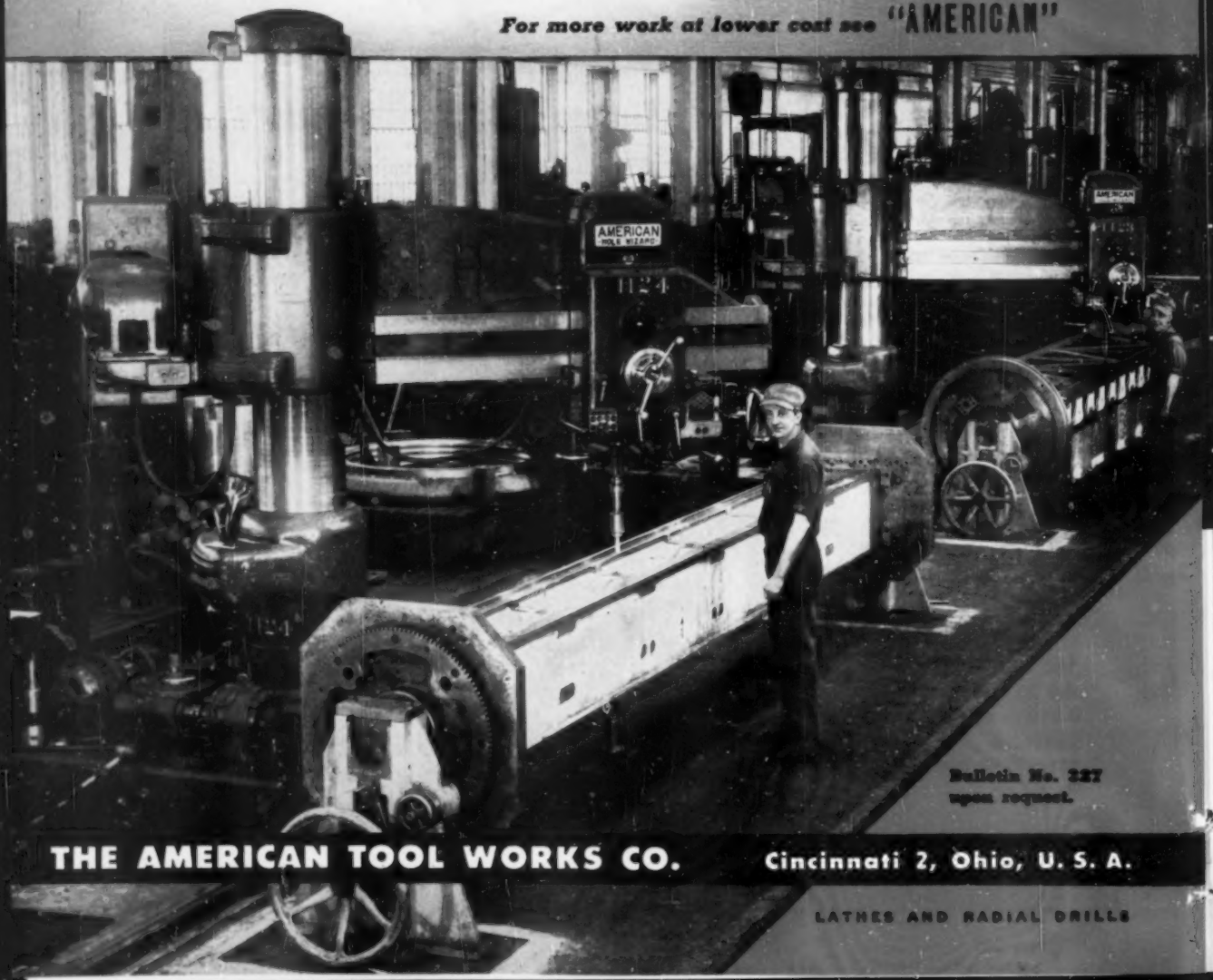
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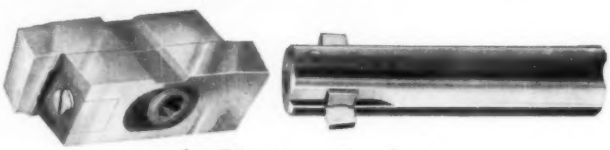
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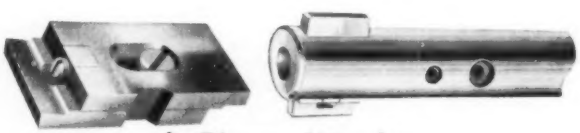
# Madison Men cover every phase of Inner Diameters

**BORING.** For rough boring, MADISON Roughing Bars are available in sizes to properly handle the complete range of MADISON Rough Boring Cutters. Only MADISON features Free Cutting Action and One-Screw Adjustment.



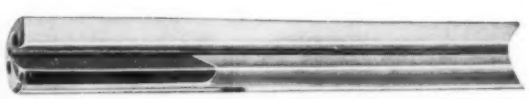
for Diameters 1″ and up

**REAMING.** For finishing a hole to size with close tolerance and good finish, use the MADISON Reaming Tool. The MADISON features of Interchangeability, Adjustability and Controlled Float are inherent in every MADISON Tool.



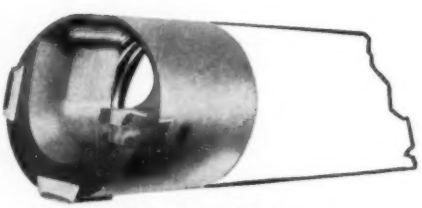
for Diameters 5/8″ and up

**DEEP HOLE DRILLING.** For producing truer, more accurate, finer finished holes, in one operation from the solid through gun-drilling techniques, use MADISON Deep Hole Drilling Tools. Unexcelled for both deep and shallow drilling applications.



for Diameters 5/32″ to 2″

**TREPANNING.** Where relatively large diameters are to be produced from solid stock, use MADISON Trepanning Tools. Through solid-core removal, faster cycle time, saving of material and reduction of horsepower requirements are realized. Depth of hole is unlimited.



for Diameters 2″ and up

**ROLLER BURNISHING.** To obtain a mirror-smooth burnished surface in any cylindrical bore, regardless of length, use MADISON-FAESSLER Roller-Burnishing Tools. Micrometer adjustment. Self feeding. Quick, simple operation.



for Diameters 1/4″ to 12″

**GAGING.** For checking the accuracy of the hole produced, use MADISON Adjustable Boregages. Sets available in individual combinations or to cover the complete range of holes. Speeds gaging operation, cuts gage inventory cost. Ease of setting provides for rapid change in size or tolerance.



for Diameters 3/4″ and up

Write today for literature on Madison Adjustable Boring and Reaming Tools, Deep Hole Drills, Trepanning Tools, Adjustable Boregages, and Faessler Roller-Burnishing Tools.

*"inner diameters are our business"*

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INDUSTRIES INC.
-FAESSLER TOOL CO.

**DEPT. TE, MUSKEGON, MICHIGAN**

# Production Pointers from GISHOLT

MASTERLINE GISHOLT SINCE 1887 TIME-SAVING IDEAS

*Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.*

## HOW SMART PRODUCER SOLVES TRICKY MACHINING PROBLEM

### Saddle Type Turret Lathe with 4-Way Fixture and JETracer on Octagon Turret Makes Complex Job Easy

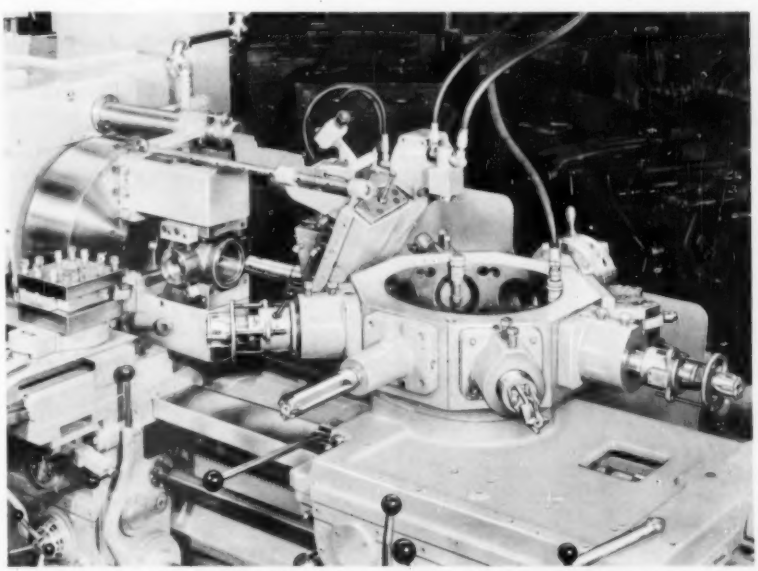
Here, the producer solved a complex problem by carefully planning his tooling and by selecting a machine designed and equipped for most efficient handling of the job.

The objective was to completely machine steel valve bodies in one chucking for maximum accuracy. By using a Gisholt MASTERLINE 3L Saddle Type Turret Lathe with special features, the producer greatly simplified the entire operation.

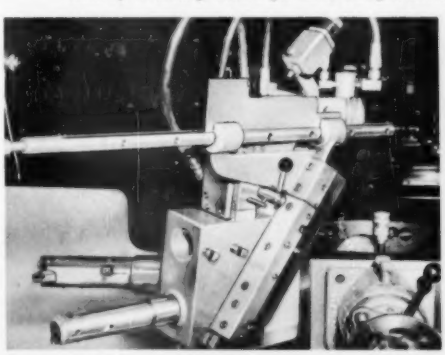
Loading and unloading are made quick and easy with a built-in power hoist. The workpiece is held in a special four-position indexing fixture, carried in a 24-inch two-jaw air chuck. Maximum accuracy is assured by completing all surfaces in a single chucking. An eight-sided octagon turret, mounting a Gisholt JETracer on one turret face, plus seven other fully tooled turret stations and a fully tooled square turret are used to complete the job. A full-length lead screw and selective gear box are used for accurate threading. A 50 h.p. single-speed motor assures smooth, dependable operation with ample power when needed.

Here is the machining sequence: Locate and chuck in fixture. Machine all surfaces on End A. Index fixture. Machine all surfaces on End B. Index. Machine End C. Index. Machine End D. Index back to starting point. Contour-bore A in one pass with turret-mounted JETracer and tap to complete the part. Floor-to-floor time is approximately 25 minutes for the 2-inch screwed-end type valve body.

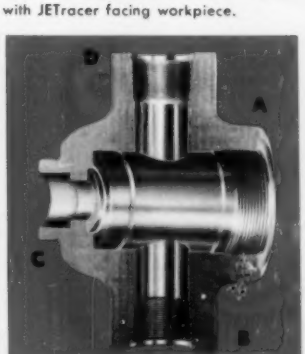
*All surfaces are machined in a single chucking, using Gisholt 3L with JETracer and special indexing fixture. JETracer does not impede normal operation and offers maximum accuracy with minimum attention from the operator.*



Close-up of tooling. Note eight-sided octagon turret, with JETracer facing workpiece.



Close-up of JETracer, which finishes all bores, counterbores, steps and faces from End A.




The workpiece—a 2-inch screwed-end type steel valve body—showing machining operations performed.

MASTERLINE GISHOLT SINCE 1887

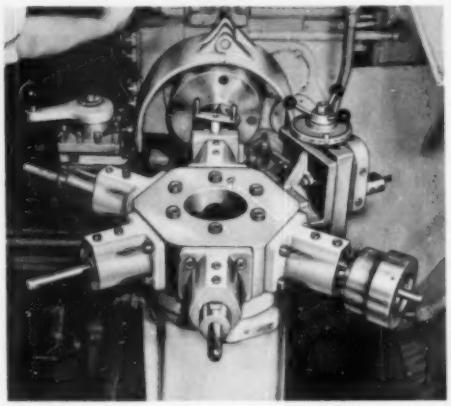
TIME-SAVING IDEAS

## ACCURATE TAPER GENERATED WITH THIS SETUP

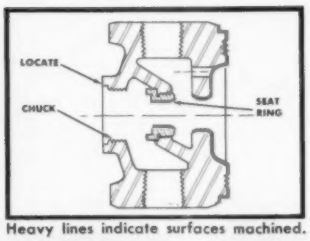
### Special Boring Tool on Ram Type Turret Lathe Speeds Valve Body Output

Good headwork by this producer is saving both time and money on production of steel relief valve bodies—using a Gisholt Ram Type Universal Turret Lathe.

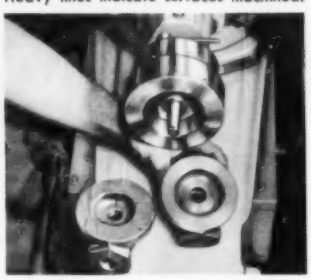
The workpieces have been previously machined and threaded in the I.D., and the seat ring has been inserted. Each part is screwed onto a special threaded fixture locating against the previously machined face. The flange and seat ring bores are machined simultaneously from the hexagon turret. Other hex turret tools ream and size both bores, finish the taper on the seat ring, and chamfer the back and front of the flange bore. Tools on the square turret turn the O.D. part way, then face, groove and form the flange face.



Overhead view of tooling, showing chamfering operation being performed in flange bore.




Heavy lines indicate surfaces machined.

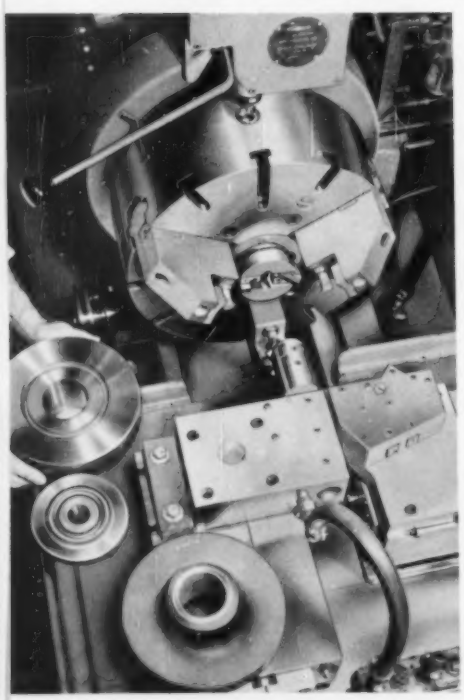


Close-up showing special taper tool, with finished workpiece below in operator's hand and rough part at left.

Of particular interest is the special taper tool, which machines the taper on the seat ring. A stop collar engages its outer face with the flange face on the workpiece, and rotates with the work. Then the boring bar—extending from the center of the tool—is cammed by continued forward movement of the turret ram, generating the precise angle desired on the seat ring.

***Machining operations are simplified on this job with minimum special tooling. Floor-to-floor time is just 8.5 minutes.***

## BEATS HIGH COSTS ON MACHINING PARTS IN 13 SIZES



### Simplimatic with Back-Facing Attachment and Two-Speed Motor Handles Each Part in Single Chucking

There's more to this job than meets the eye. Not only are two different types of parts machined, but each type comes in 13 different sizes! The workpieces—steel welding neck flanges and welding necks—are used to join high-pressure piping.

Here's how a Gisholt Simplimatic Automatic Lathe completes each part in a single chucking and holds changeover time to an absolute minimum.

Facing, grooving, boring and chamfering operations are performed from tools on short tool slides, with T-slotted tops for quick adjustment. The boring tool is relieved at the end of the cut to eliminate tool tracks. At the same time, a special back-facing attachment works through the spindle to shave-face and chamfer the O.D. on the hub. A power chuck wrench operates the scroll chuck, and permits mounting the back-facing attachment in the spindle bore. Correct surface speed in f.p.m. is provided by a two-speed motor, equipped to switch from high speed (for turning and facing) to low speed (for grooving operation) and back again, during the Simplimatic's automatic machining cycle.

***Good planning on Simplimatic holds f.t.f. time on smallest 6½" diameter workpieces to only 1.7 minutes, on largest 10¾" diameter workpieces to just 3.3 minutes.***

Close-up shows machined front side of large workpiece (in operator's hands) and of small workpiece...machined back side of large workpiece in foreground...power-chuck wrench...and back-facing attachment protruding through spindle bore.

GISHOLT

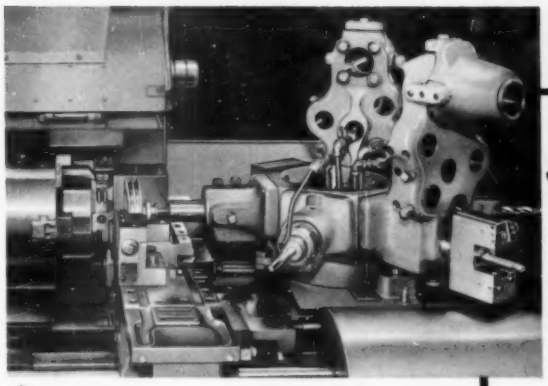
TIME-SAVING IDEAS

# 400% INCREASE IN PRODUCTION WITH THIS SETUP

## Well-Planned Casting Design Plus Good Setup on Fastermatic Quadruples Unit Output

Here's how Albertson & Company, Inc., of Sioux City, Iowa, has put production of small, cast iron sheaves on a high-speed, high-production basis with a Gisholt 1F Fastermatic Automatic Turret Lathe. Tooling costs are held to a minimum, but where necessary, multiple cuts are taken to assure maximum accuracy.

To exploit the full potential of the versatile Fastermatic, Albertson designed the workpiece with a special chucking ring as part of the original casting. A standard three-jaw air chuck holds the part on this ring throughout the machining operations. Hexagon turret tools turn all outside diameters, complete the bore and shave-face the small hub. Special form tools on the front cross slide form grooves on small hub. Similar form tools on the rear cross slide form V-belt grooves on large sheave O.D., after which a parting tool cuts the piece off the chucking ring. Simultaneously, a special catcher on Station No. 5 slips in the bore to receive the part. The hexagon turret indexes to the next station and the cycle stops. The operator unchucks the chucking ring—inserts a new workpiece—and removes the finished sheave from the catcher, to inspect it while the new part is being machined.



Workpiece shown after cut-off. Special turret-mounted catcher holds completed part.

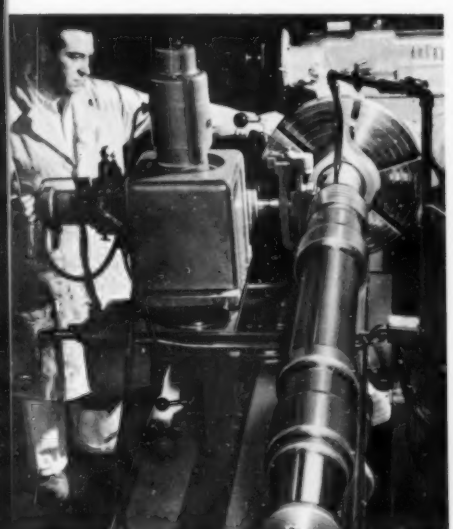


Top to bottom: casting with chucking ring on; chucking ring after cut-off; finished workpiece.

*Smart setup on this Gisholt Fastermatic jumped production on this job from 24 pieces to 100 pieces per eight-hour shift—shortening floor-to-floor time to only 4.5 minutes.*

# "HOT BOX" TROUBLES REDUCED BY SUPERFINISH

## Simple Attachment Reduces Costs, Increases Service Life

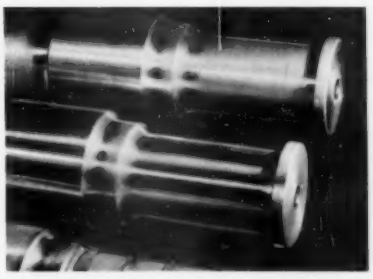


"Test" axles being Superfinished on Gisholt Saddle Type Turret Lathe equipped with No. 4 Superfinishing Attachment on the side carriage.

The "hot box"—as applied to journal and plain bearings—is one of the most critical situations faced by the railroads today. Davenport Besler Corporation investigated the Superfinishing process and had a complete set of axles Superfinished and installed on a switcher for testing. After four months of service, no trouble was reported.

Davenport Besler then installed a Gisholt No. 4 Superfinishing Attachment on an engine lathe in its own shop. The journals are turned to an average lathe finish of 200-250 micro-inches rms. After a three-step—rough, semi-finish and finish—Superfinishing operation, a final surface finish of 8-10 micro-inches rms is obtained. The floor-to-floor time varies from 15 to 30 minutes because in some cases, .004" to .005" stock has to be removed to eliminate all toolmarks.

Over 25 switchers were put in service with all axle journals Superfinished. During the first few months, some 30,000 hours of trouble-free operation were recorded, proof-positive that Superfinish really pays off!



Before and after Superfinishing. Top journal after turning...lower journal has been Superfinished to 8-10 micro-inches rms.

*Superfinishing from a turned surface saves considerable production time. Because amorphous or smear metal is removed and the true base metal exposed, it is no longer necessary to harden the work surface—an added saving through the modern Superfinishing process.*



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TIME-SAVING IDEAS

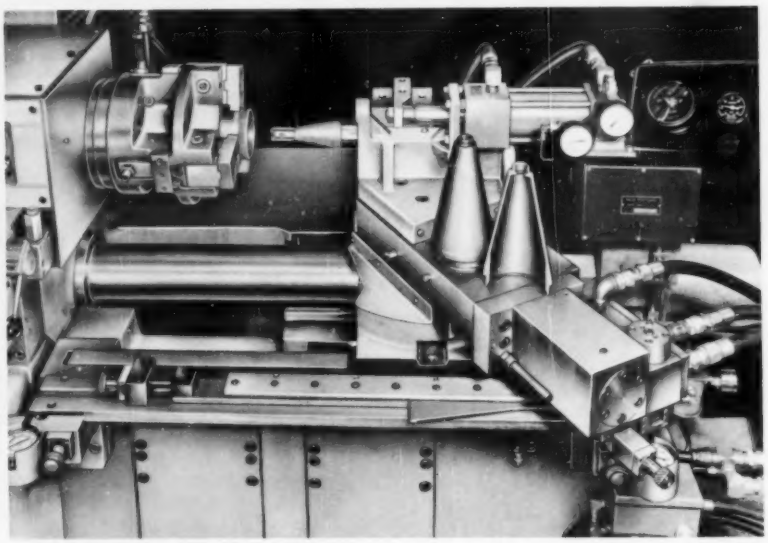
# AN EXCELLENT WAY TO HANDLE TAPER BORING OPERATIONS

## No. 12 Automatic with JETracer, Variable Speed Drive and Special Fixture, Whips Problem Part

This manufacturer wanted to cut costs, increase production and improve the finish in taper boring operations on shell noses. He's doing it with a Gisholt MASTERLINE No. 12 Automatic Production Lathe, equipped with a JETracer in place of the usual front carriage.

The workpiece tapers on the O.D. from four inches to 1⅜ inches. It is chucked without distortion by a special air-operated three-jaw chucking fixture, with the jaws gripping on the large O.D. Accurate longitudinal location is obtained through an adjustable work-centering cone in the spindle.

The problem of maintaining a 125 micro inch finish for the entire tapered length of cut is solved by a variable speed drive arrangement, controlled by longitudinal motion of the JETracer slide carriage. The JETracer slide traverses to the workpiece and changes to feed for the boring operation. At the end of the cut the boring bar retracts, providing tool relief, and the slide returns to starting position.



Special chucking fixture shown at left. Boring bar and tool-relief arrangement shown at right rear. Finished workpiece and cut-away section, on front of JETracer slide, show surfaces machined.

*Smart chucking arrangement—plus Gisholt JETracer on No. 12—permits completing I.D. on this job in only .77 minute floor-to-floor time.*

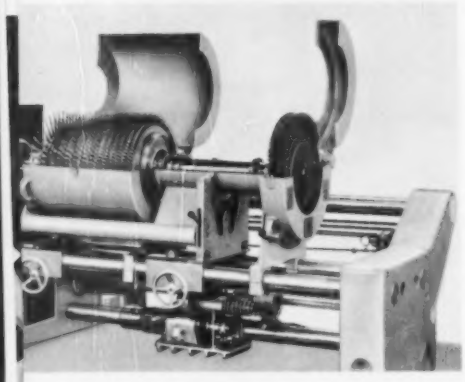
# HIGH-SPEED LIFE INSURANCE THROUGH ASSEMBLY BALANCING

## Eliminates Unbalance Caused by Cumulative Tolerances of Component Parts

One of the reasons why today's jet pilots can fly with greater safety—at faster speeds and higher altitudes—is modern assembly balancing of their engines.

Here is a typical example. This Gisholt DYNETRIC 3UJP Balancing Machine is used to balance jet engine rotor assemblies, consisting of a turbine shaft, two turbine wheels, and a compressor which has been balanced before assembly. The entire rotor assembly is dynamically balanced to a tolerance of .50 ounce inches in the right plane, with correction made by removing stock from a balance-ring machined on the outside face of the second turbine wheel—and to a tolerance of .75 ounce inches in the left plane, with correction made by adding weight on the flange at the junction of the compressor and the turbine shaft. After balancing, the parts are match-marked and are then disassembled.

*Assembly balancing permits balancing ultimate assembly as a unit, providing smoother-running, longer-lasting modern jet engines.*



Gisholt DYNETRIC 3UJP Balancing Machine, showing balancing of jet engine rotor assembly. For consultation with engineering specialists on vibration or balancing problems, write Gisholt.

DYNETRIC BALANCERS GISHOLT

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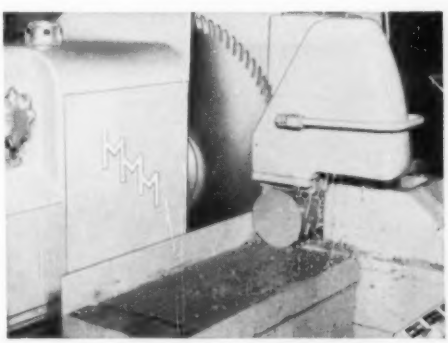


## TRIPLE C GRINDING COOLANT

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A good coolant works best in a clean machine

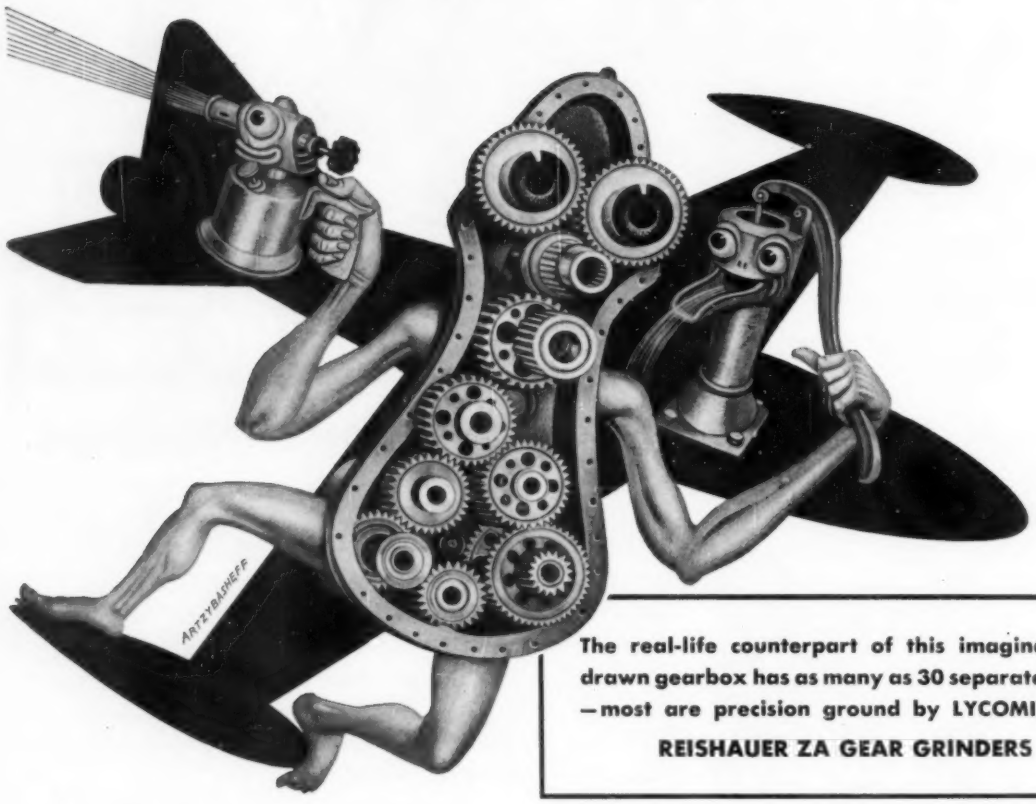
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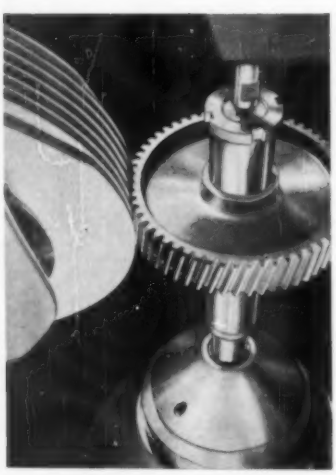
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# Precision gears go flying




**The real-life counterpart of this imaginatively drawn gearbox has as many as 30 separate gears —most are precision ground by LYCOMING on REISHAUER ZA GEAR GRINDERS**



Single-thread grinding worm and spindle of the Reishauer ZA.

Auxiliary "nerves" of the mighty J-40 and J-47 jet engines, these precision gears transmit power to run fuel and oil pumps, generators, and other vital accessories. Lycoming, maker of this intricate gearbox, depends on Reishauer ZA gear grinders for precise, rapid production of gears.

Lycoming likes the way Reishauer consistently produces gears to extremely close tolerances at high production speeds. Furthermore, operators on the production line benefit from the simplicity and cleanliness of the machines' operation.

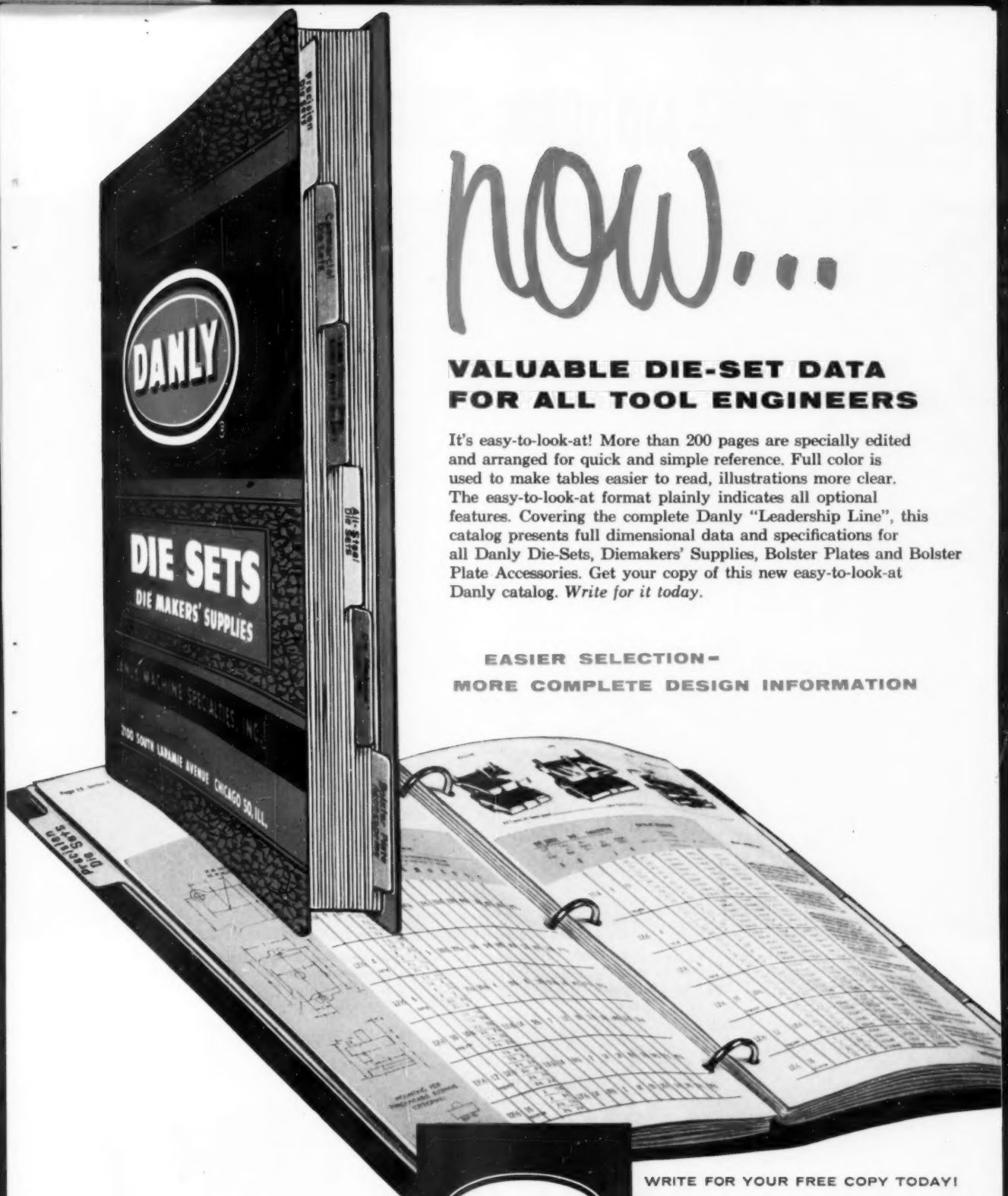
Lycoming is not alone in its respect for Reishauer grinders—these machines are widely used to grind spur and helical gears in the automotive and aircraft industries. Other users include machine tool builders, gear-jobbers, and instrument manufacturers.

In short, Reishauer ZA grinders are excellent machines. If you want proof, we'll be happy to supply it. Get in touch with us soon, won't you?

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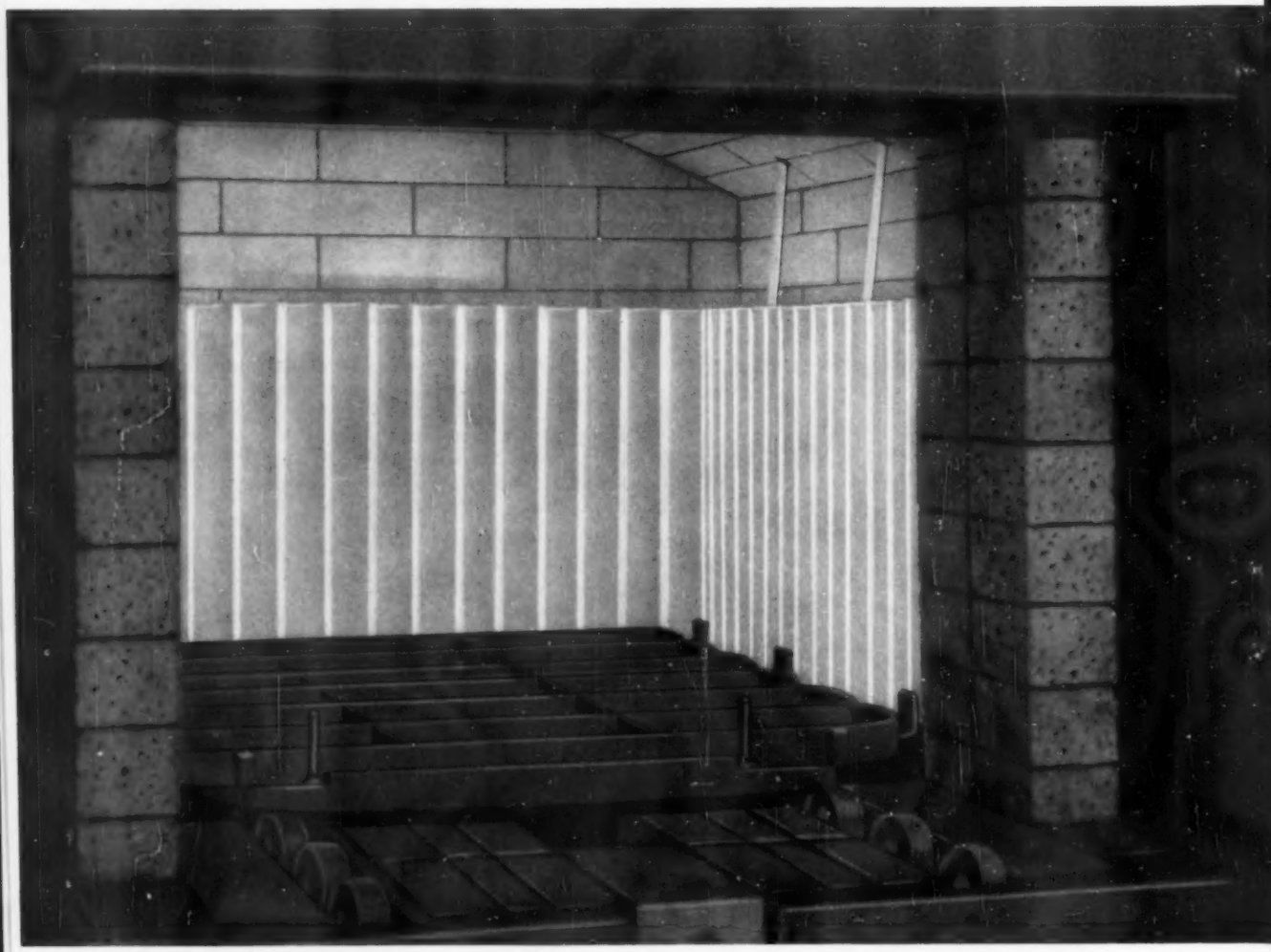
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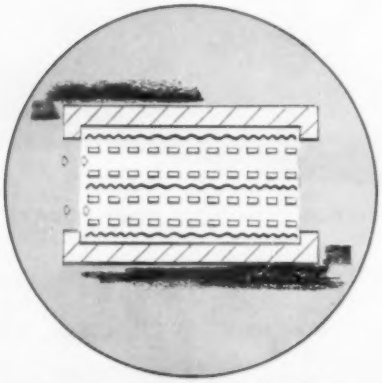
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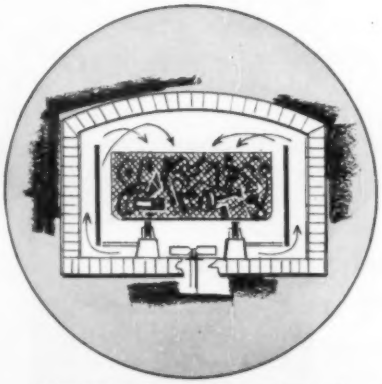
# BRAND NEW–MODERN ELECTRIC ELEMENT



This shows graphically how the new Lindberg CORRTHERM electric heating element actually fills the furnace with walls of glowing heat. Note also that CORRTHERM is conveniently hung from simple brackets requiring no complicated connections or construction. This element operates at extremely low voltage, eliminating shock or short hazards.



In continuous type furnaces CORRTHERM elements hang between lines of work as well as on side walls. Note how closer corrugations (at each end of element) compensate for incoming cold work and door losses.



CORRTHERM elements act as natural baffles to direct forced convection streams through the charge. The use of electric furnaces for carburizing and carbonitriding now becomes completely practical.



No retort needed in pit-type carburizing furnace with CORRTHERM elements. Again see how elements serve as baffles to direct forced convection stream through charge.

# FOR LINDBERG FURNACES



CORRTHERM elements are large sheets of corrugated nickel chromium. They were developed in Lindberg laboratories by Lindberg metallurgists and engineers.

Never before has there been an electric heating element like this CORRTHERM by Lindberg. Its revolutionary advantages now make the use of electricity as the source of heat, practical, efficient and economical for all heat treating processes.

Ideal for use in any electric heat treating furnace, CORRTHERM elements have particular advantages for carburizing and carbonitriding. This new element completely eliminates problems formerly created by the use of electricity in these types of furnaces. These exclusive advantages of CORRTHERM explain how and why:

**LOW VOLTAGE:** Operates at extremely low voltage. No leakage through carbon saturation. Around Lindberg we talk about it as the electric element "without any electricity . . . to speak of!"

**ATMOSPHERE CIRCULATION:** Elements act as baffles to direct circulation of convection streams.

**SAFETY:** Extremely low voltage also eliminates shock or short hazards.

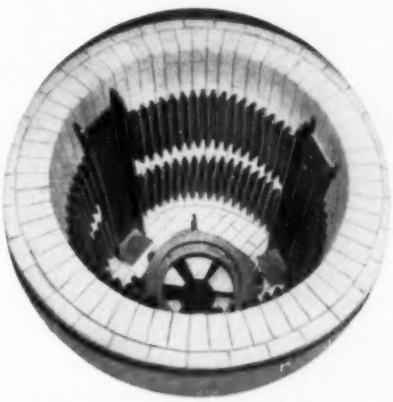
**DURABILITY:** Watts density at all-time low. Element practically indestructible. Work load or operator's charging tool can't hurt it.

**EASILY INSTALLED:** Element is not enclosed, just hangs in furnace. No complicated mountings required.

If electricity is the preferable source of heat for your metal treating processes find out how advantageously CORRTHERM elements can be applied to your requirements. Just get in touch with your nearest Lindberg Field Representative. (Consult your classified phone book.)



This shows installation of CORRTHERM elements in one of two large rotary furnaces currently being erected in the field by Lindberg's associate company, Lindberg Industrial Corporation.



An installation of CORRTHERM elements in a carburizing pit-type furnace. Simplicity of mounting makes replacement easy and economical.

# LINDBERG


**LINDBERG ENGINEERING COMPANY**

**2447 West Hubbard Street, Chicago 12, Illinois**

**Los Angeles Plant:** 11937 South Regentview Avenue, at Downey, California

**Associate Companies:** Lindberg Industrial Corporation, Chicago • EFCO-Lindberg, Ltd., Montreal, Canada
Lindberg Italiana, Milan, Italy • The Electric Furnace Company, Ltd., Weybridge, Surrey, England
Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany




Safety! Extremely low voltage makes CORRTHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt.

# CORRTHERM

## by LINDBERG

# KENNAMETAL

# K7H

## has a definite place in your operations

- for high-velocity machining
- for cutting heat-treated steels
- for cutting high tensile steels

Kennametal* Grade K7H is being selected by shop after shop for high-velocity cutting operations . . . chiefly because of these desirable cutting edge characteristics: High hardness (93.5 Rockwell A) combined with phenomenal strength (three times that of nonmetallics); exceptional wear resistance and maximum resistance to cratering; excellent retention of strength even at high temperatures; and top resistance to shock.




Use Kendex Tooling with turn-over inserts (available in 17 styles and over 200 tools) . . . for lowest cost per cutting edge.

### HERE ARE EXAMPLES OF K7H PERFORMANCE

**Doubles production:** Cutting 1½" wide stators of welded laminations of 2% silicon steel, K7H has out-performed all other cutting edges by better than two to one, with 147 pieces averaged per index for K7H against only 65 pieces per index with the best competitive carbides. *Conditions:* 900 sfm, .0083" feed, and .015" depth of cut. *Results:* Higher total production at end of day, with less machine down time, less scrap, better quality by holding tolerances, and lower tooling cost per stator ($0.00109).

**Outperforms ceramics** by more than 30 to one in test boring SAE 1020 steel, flash hardened, length of bore 1¼", depth .025" at 900 sfm. Grade K7H cut 67 pieces while ceramics only cut two (ceramics chipped). *Result:* K7H ordered for the operation.

**K7H cuts 252 pieces as compared to 30 . . .** the best record for a competitive carbide in facing cut to dead center of SAE 1018 steel 5" O.D. gear blank, at 1000 sfm (at outer edge) and .008" depth of cut. *Result:* Standardized on K7H.

**Performance 3 times greater** than with competitive carbide cutting cast steel stator housing with six interruptions at 700 sfm, .014" feed, and ⅛" depth of cut. *Result:* K7H was selected for the job.

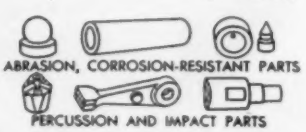
Why not discuss your machining problems with a Kennametal tool engineer. He will help you take full advantage of this remarkable cutting grade. Call him or write KENNAMETAL INC., Latrobe, Pa.

*Registered Trademark

B-5957




INDUSTRY AND
KENNAMETAL
...Partners in Progress






# Sun's Heavy Duty Emulsifying Cutting Oil excels on high-alloy aircraft steels

S.E.C.O. Heavy Duty handles all machining jobs requiring an emulsifying cutting oil. Piasecki Helicopter's large job shop at Morton, Pa., found this out three years ago when S.E.C.O. HD* replaced two expensive heavy-duty soluble oils in machining fan hubs.

Extremely versatile and moderately priced, S.E.C.O. HD has been doing an exceptional job in cutting a variety of high-alloy aircraft steels for Piasecki.

For more information about S.E.C.O. HD, see your Sun representative. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. TE-7.

**WRITE FOR FREE TECHNICAL INFORMATION**

- *Cutting and Grinding Facts*
- *Disposal of Waste Emulsions*
- *New Improved S.E.C.O.*
- *S.E.C.O.—Mixing Instructions*
- *S.E.C.O. HD*

SUNOCO

*TRADE-MARK

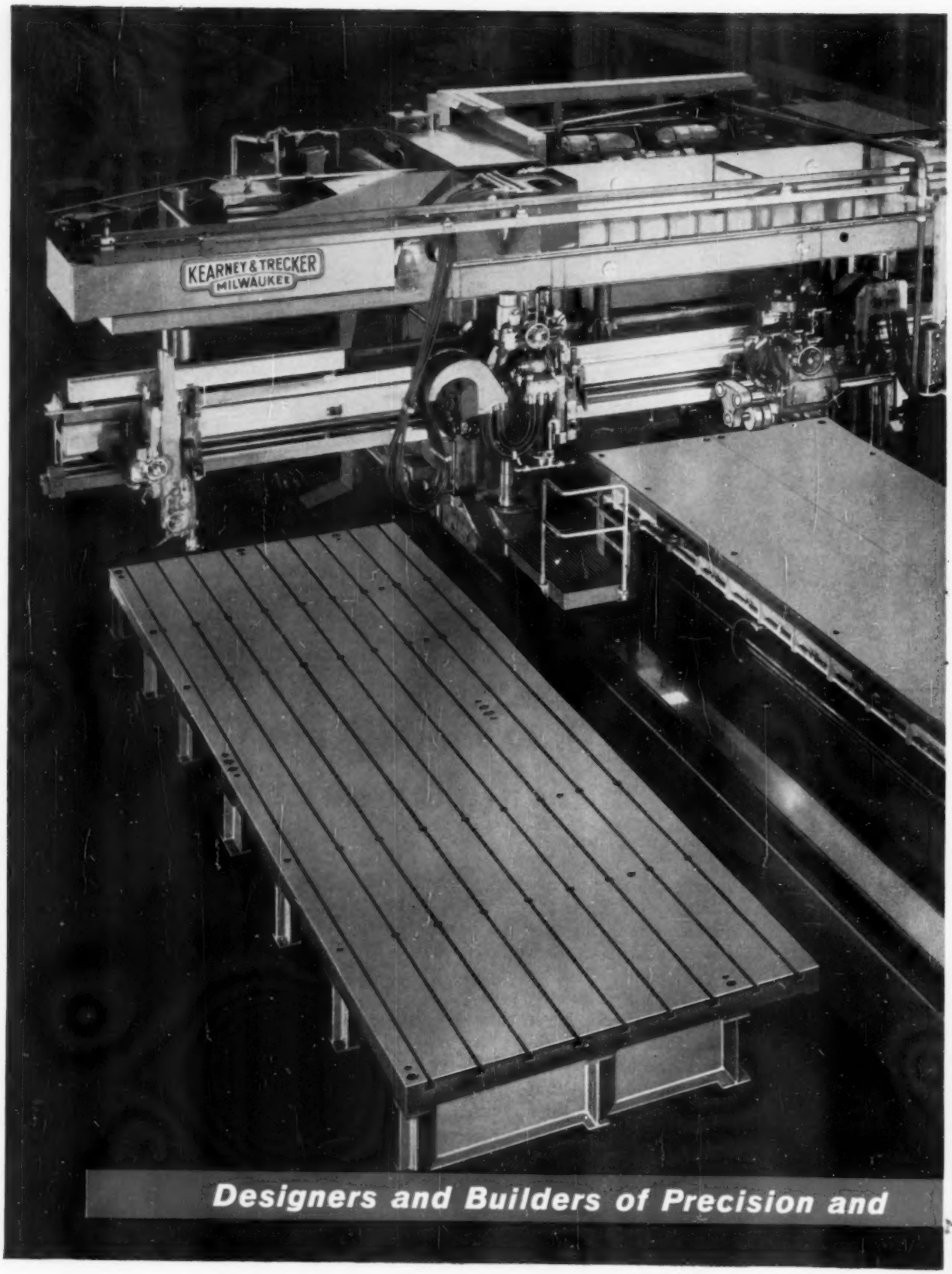
**INDUSTRIAL PRODUCTS DEPARTMENT**

**SUN OIL COMPANY**

Philadelphia 3, Pa.

© SUN OIL CO.

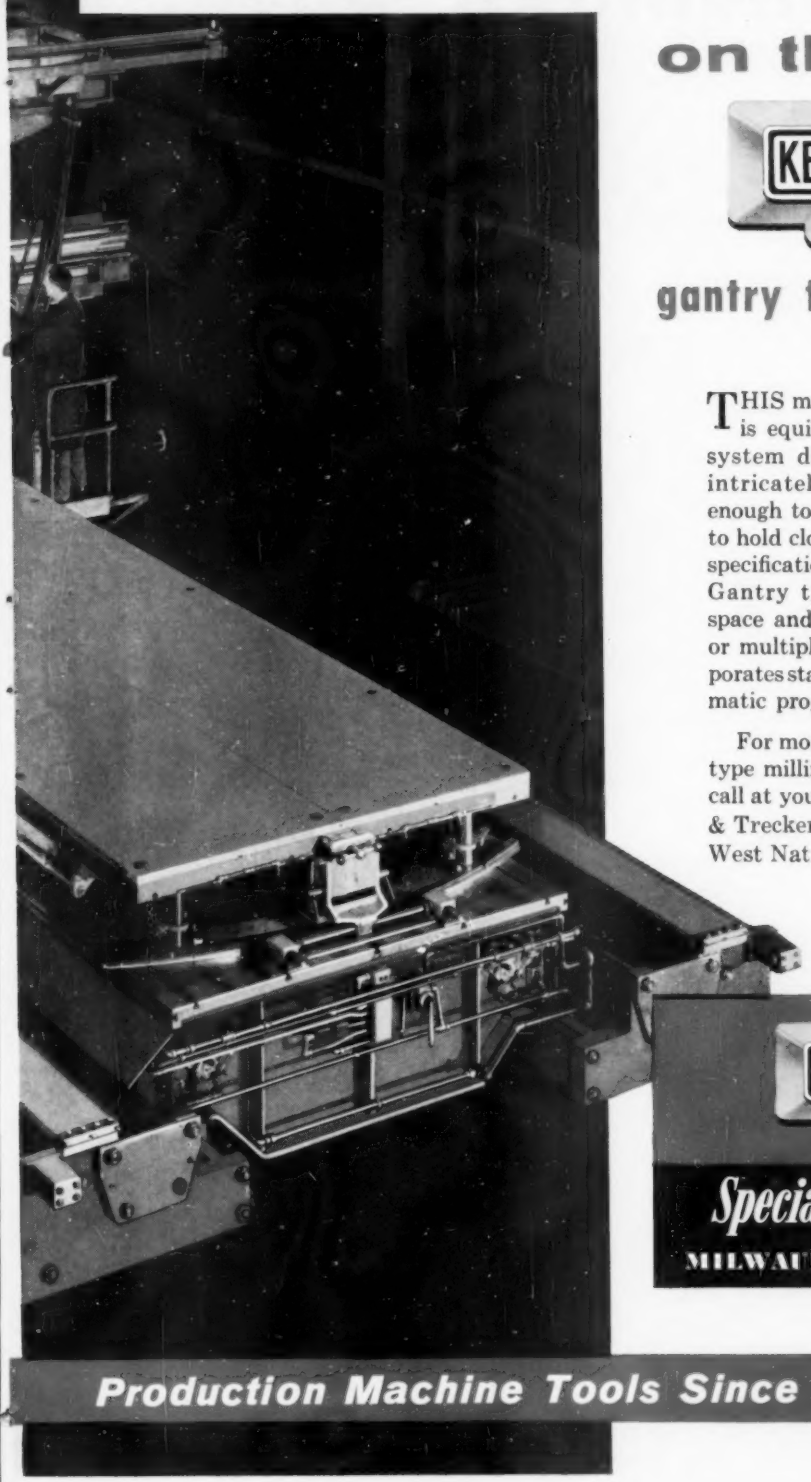
IN CANADA: SUN OIL COMPANY LIMITED, TORONTO AND MONTREAL


KEARNEY & TRECKER
MILWAUKEE
Designers and Builders of Precision and

# Picture your workpiece on this 175-ton

KEARNEY & TRECKER MILWAUKEE

## gantry type milling machine



THIS massive giant, 42 ft. long, 35 ft. wide, is equipped with electronic tracer control system designed for production milling of intricately contoured workpieces. Rugged enough to mill all metals . . . sensitive enough to hold close tolerances . . . it meets all A. I. A. specifications and has extendable bed design. Gantry type machine takes much less floor space and permits handling larger workpieces or multiple workpiece setups. Machine incorporates standard design components with automatic programming control systems available.

For more specific information on this gantry type milling machine, have our representative call at your convenience . . . or write to Kearney & Trecker, Special Machinery Division, 6772 West National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER MILWAUKEE

*Special Machinery Division*

MILWAUKEE 14, WISCONSIN, U.S.A.

***Production Machine Tools Since 1898***

# Cincinnati Shear's

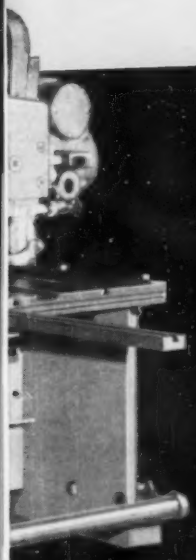
## and ACCURATE

*Photos courtesy Despatch Oven Company, Minneapolis, Minnesota.*




**New front controlled power back gauges are now standard equipment on ALL CINCINNATI SHEARS.**

# fast, easy gauge setting... *SAVES TIME!*



Cincinnati features bring speed and accuracy in turning out panels for industrial ovens at the Despatch Oven Company.

5′ x 10′ sheets are trimmed four sides—corners are square, sides are clean and straight and panels are sheared accurately to size.

Cincinnati quick, convenient and positive gauging, accurate knife alignment and powerful hydraulic hold-downs speed performance.

Despatch Oven Company say—"This shear has brought an operating time saving, reduced time for maintenance. Performance very good."



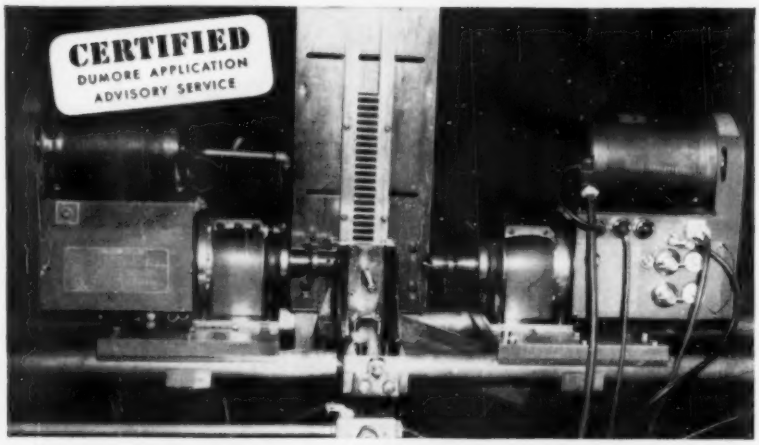
**Write for Shear Catalog S-7.**
**If you shear we can help you.**

## THE CINCINNATI SHAPER CO.

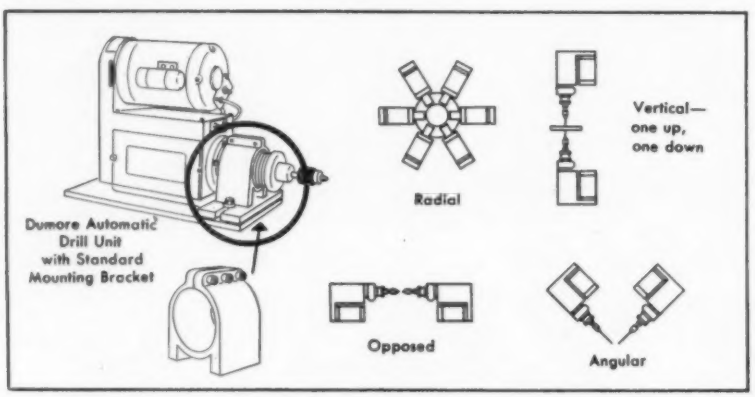
CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

# Facing-Deburring Job Speeded Up 300% with Versatile DUMORE Automatic Drill Units




**This "Special" Machine,** constructed from standard parts, faces and deburrs four times as many steel pipe sections as the previous method. As each part falls from the hopper to the fixture, an automatic switch actuates a clamping device to hold the part. The two Dumore Automatic Drill Units, also actuated, advance, face and deburr the ends simultaneously, and retract to starting position—all automatically.




**Key to Simplicity** of the Dumore Automatic Drill Unit is the standard mounting bracket which permits quick removal and transfer of Dumore Units to other shop operations. These low cost brackets quickly adapt Dumore units...at any angle...to existing shop equipment. Dumores are delivered complete and ready to be used. All controls, electrical and pneumatic are built in.

Star Tubular Products Co. of Chicago wanted to step-up production of their welded steel pipe sections. A major stumbling block was the slow job of facing and deburring both ends of each section. The process required handling each part three times: facing and deburring one end, removing and reversing the part, facing and deburring the other end. Output was 135 pipe nipples per hour. Dumore was asked to find a better, faster method.

### Technical Application Aid

Dumore's Application Advisory Service recommended a set-up that resulted in the machine pictured at the left: two Automatic Drill Units opposing each other with a hopper feed for the pipe sections in the center. As each pipe section falls into the fixture, it actuates the Automatic Drill Units which move in and face and deburr each end simultaneously, retract to starting position, actuate work feed and advance again—all automatically.

### Production Goes Up

The set-up, as simple and inexpensive as it was, boosted production to 500 parts per hour—a 300% increase. In addition, the accuracy of this finishing process permitted the company to roll-cut their tubing, instead of square cutting, reducing the cut-off operation time by 300%!

The "multiple-use" value of Dumore Automatic Drill Units is still another benefit the customer gets. Its unique, simple mounting feature permits it to be quickly transferred and re-used for drilling, tapping, reaming and related operations throughout the shop, paying for itself over and over again.

DUMORE®

AUTOMATIC DRILL UNITS
TOOL POST AND HAND GRINDERS

1310 Seventeenth St., Racine, Wisconsin

**Let Dumore's Application Advisory Service help you get increased production and lower costs on jobs like this. Write for FREE Dumore Application Analysis Kit.**

the New

# ATKINS Chamfer tooth hacksaw blade

- cuts smooth
- cuts straight
- more cuts per blade




**HIGH SPEED TUNGSTEN**

For fast, efficient cutting of hard-to-machine materials—tough steels with "work-hardening" tendencies—for cutting highly abrasive materials, these long-lasting blades are your best answer.

**SOLID MOLYBDENUM**

Atkins metallurgy, heat treatment and the new Chamfer Tooth make these blades ideal for economical, all 'round cutting of ferrous and non-ferrous metals.

**WELDED-EDGE MOLYBDENUM**

A shatter-proof hacksaw blade with a high-speed Molybdenum Chamfer Tooth cutting edge that combines increased production life with greater safety for general all-purpose cutting—both ferrous and non-ferrous.

ATKINS Silver Steel SAWS

ENGINEERING B-W PRODUCTION

**ATKINS SAW DIVISION**
**BORG-WARNER CORPORATION**
**INDIANAPOLIS 9, INDIANA**

BRANCHES: Chicago • Philadelphia • Los Angeles • Chattanooga • Portland, Ore.

1856 • ONE HUNDRED YEARS OF SAW EXPERIENCE • 1956

# From the World's Most Complete Line . . . your MORSE-FRANCHISED DISTRIBUTOR can recommend the correct cutting tool for every job in your plant . . . regardless of tool requirements



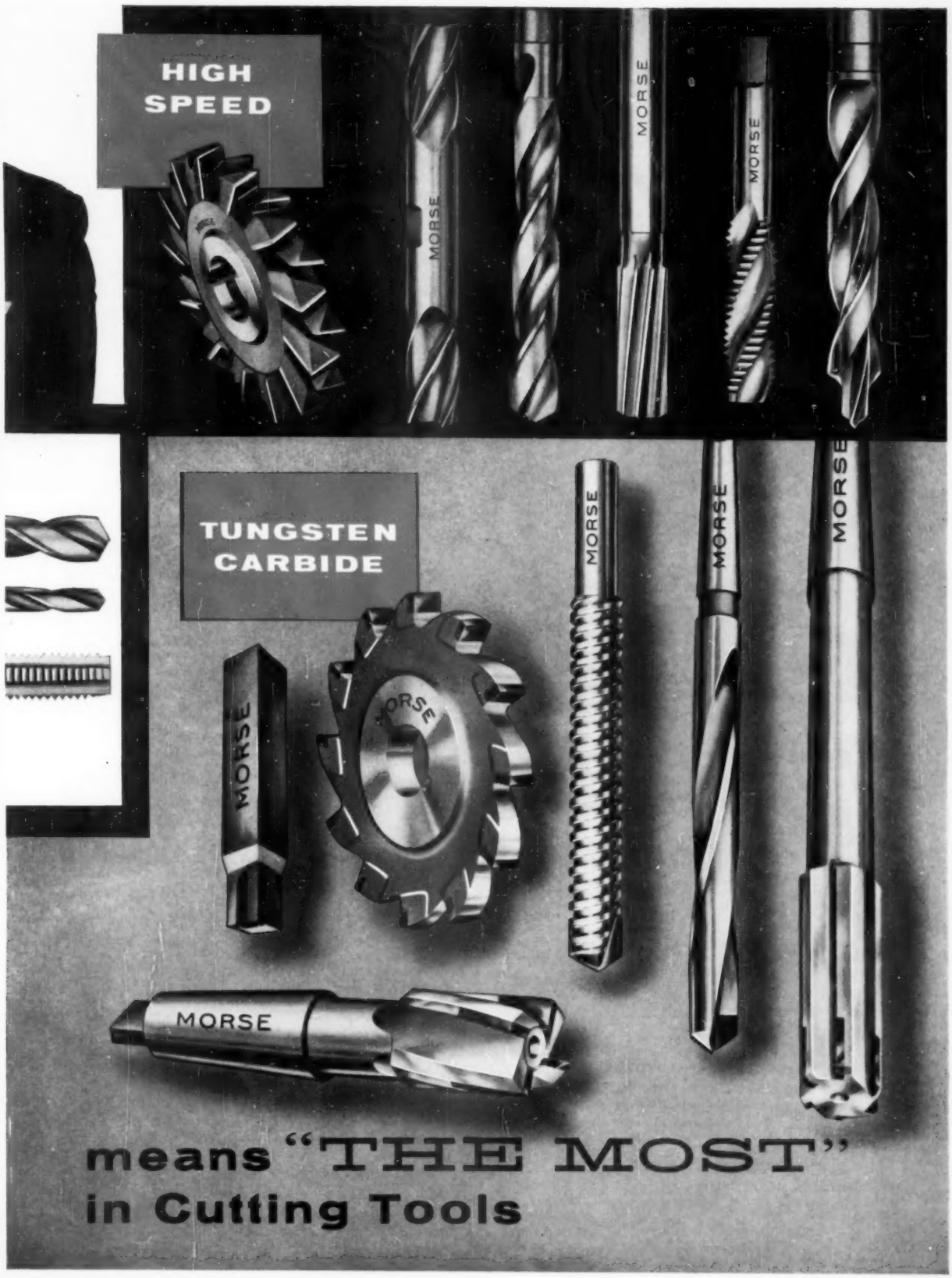

There's the whole Morse story right there in a nutshell. And it simply means that whatever you need for any job . . . carbon, high-speed or tungsten carbide, you can get it from your Morse-Franchised Distributor.

What's more, it means that Morse can give you, consistently, the lowest cost-per-cut you ever experienced. That's why it always pays to call your Morse-Franchised Distributor . . . because he's the one man who can give you "The Most" in cutting tools . . . and that means nobody (*but nobody*) but Morse! *Call him now.*

**MORSE TWIST DRILL & MACHINE COMPANY**
**New Bedford, Massachusetts**
*Subsidiary of VAN NORMAN INDUSTRIES, INC.*
*Warehouses in New York, Chicago, Detroit, Dallas, San Francisco*

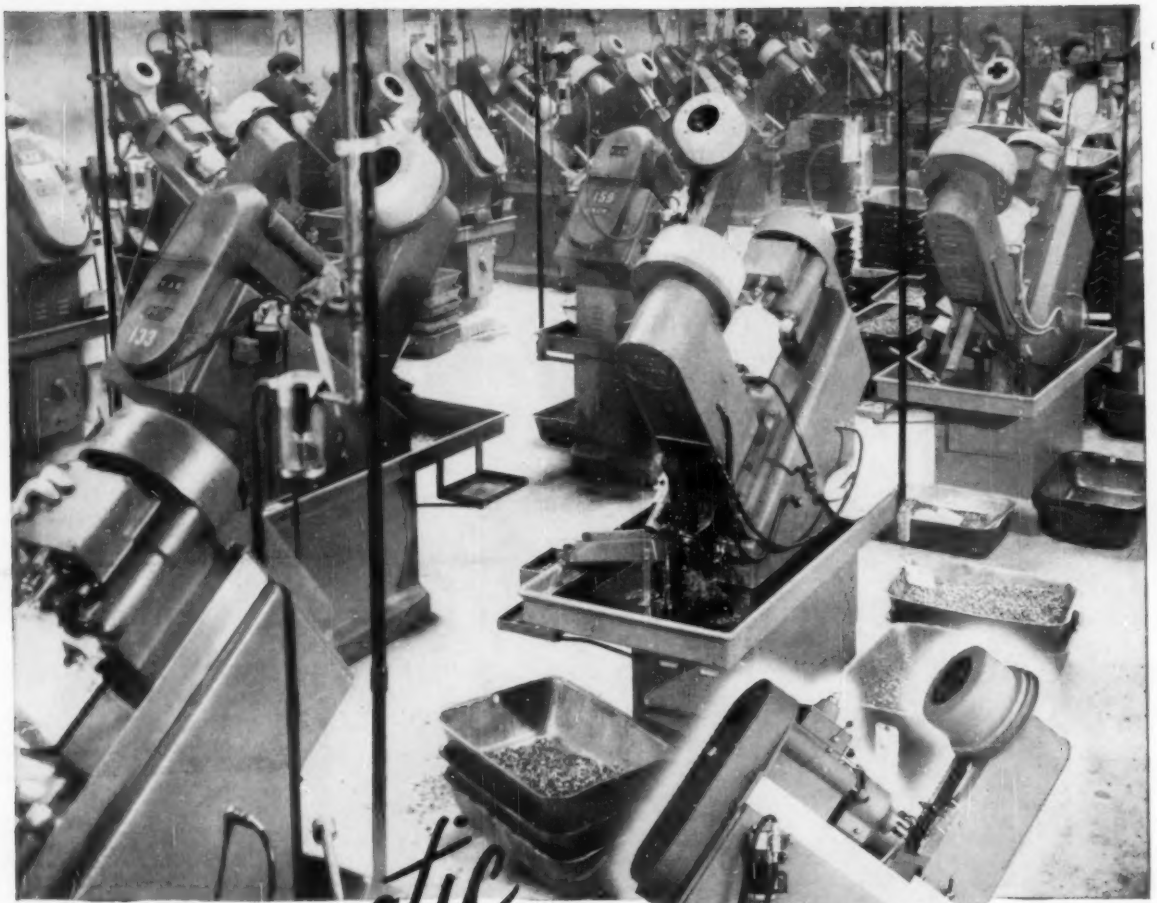
## that's why MORSE

*Buy them by phone from your Morse-Franchised Distributor and save ordering time*





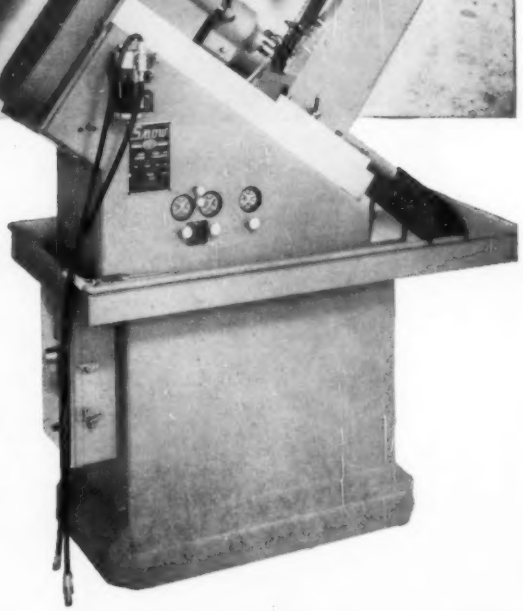

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-35



# *Automatic* NUT TAPPING MACHINES

This installation *at Shakeproof, Division of Illinois Tool Works, Elgin, Illinois,* is an illustration of productivity—*with precision.*

Simplicity of set-up and lower operational costs can make your Nut Tapping Department one of the most efficient and profitable in your plant. Submit samples and prints for a comparison with your present method.



**VERTICAL DRILLING MACHINES**
**VERTICAL TAPPING MACHINES**
**VERTICAL THREADING MACHINES**
**TWO SPINDLE MACHINES**
**ANGULAR MACHINES**
**NUT TAPPING MACHINES**
**HORIZONTAL MACHINES**
**DRILLING AND TAPPING UNITS**
**AUTOMATIC JIGS AND FIXTURES**
**DRILL PRESS TAP HEADS**

# SNOW

**MANUFACTURING COMPANY**

**435 EASTERN AVENUE, BELLWOOD, ILL.**

(Suburb of Chicago)



carbide NEWS

***WESSON Multicuts send tool costs tumbling from 42 cents to 1 cent per piece***

# Tools Developed for High Output Pay Off on Low Volume Jobs

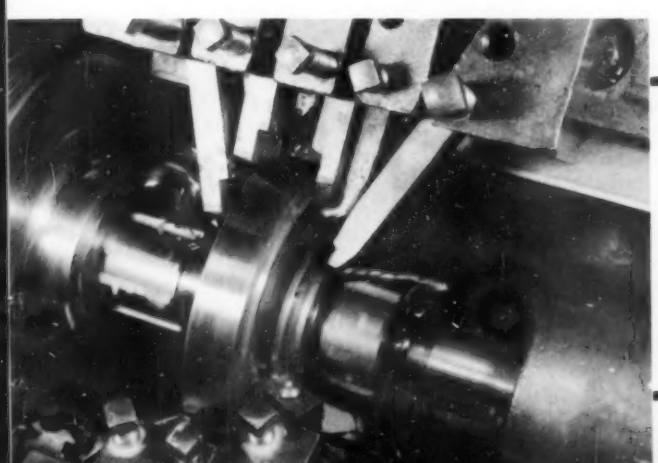
Sharply reduced tool costs and a 30 percent increase in production were the direct results of changing from conventional tooling to indexible insert carbide tooling at the plant of a mobile materials handling equipment builder. Thus the application of tools developed originally for volume production also paid off in producing parts at a relatively low output rate.

The job consisted of machining a cast steel hoist drum on a Bullard at a rate of 1.27 pieces per hour. The former tool cost of 47 cents per piece for facing and turning the flange, rough facing and turning the drum hub and finish facing and turning the hub was slashed to 1 cent as the result of a change to Wesson Multicut holders and Wessonmetal indexible carbide inserts.

Most of the former high tool cost was due to the fact that only 4 pieces per grind were obtained in machining the flange and roughing the hub. Currently the Wessonmetal WM inserts turn out 80 pieces per grind. Similarly the number of pieces in finishing the drum hub has gone up from 10 pieces per grind with the brazed tool formerly used to 120 pieces per grind with Wessonmetal WH.

Additional savings result from an 85 per cent reduction in down time for each tool change with the end result being a 30 per cent improvement in output.

Special note should be taken of the fact that these savings were achieved without resorting to special carbide grades. Both Wessonmetal WM and WH are strictly standard.



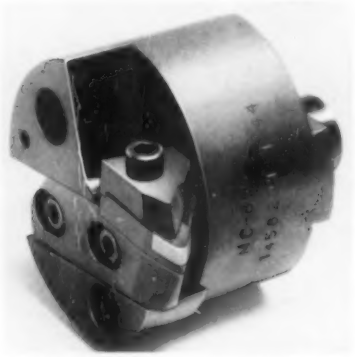
***Here's a case where "equivalent" carbides, at least in the "Classification Code", gave considerably different performances. The job is rough and finish turning multiple diameters of 4021 steel forgings in an eastern gear plant. Tool life jumped from 180 to 750 pieces per grind when Wessonmetal WH (a C-7 grade) replaced the C-7 grade previously used. Tool costs dropped from 2 cents per piece to half a mill and production increased because of lower down time. The reason? Grade WH effectively resisted cratering where the other hadn't.***

# carbide NEWS

## Boring Tool Features Throw-Away Insert

Among the increasing number of boring cutters developed by Wesson to take advantage of the throw-away insert concept is a special cutter now being used to form an internal spherical radius on an automotive differential case to close tolerances.

As in most throw-away insert boring tool designs pioneered by Wesson, a number of exacting requirements had to be met before the design was accepted and the tool placed in service. Aside from the savings in setup time and the elimination of carbide grinding, the throw-away boring tool is holding extremely close limits on the radius to within plus .001-inch. Even closer tolerances are necessarily held on the insert and holder itself.



*Special boring cutter developed by Wesson forms internal spherical radius on automotive differential case.*

## Oscillating Tool Grinder Described in Bulletin

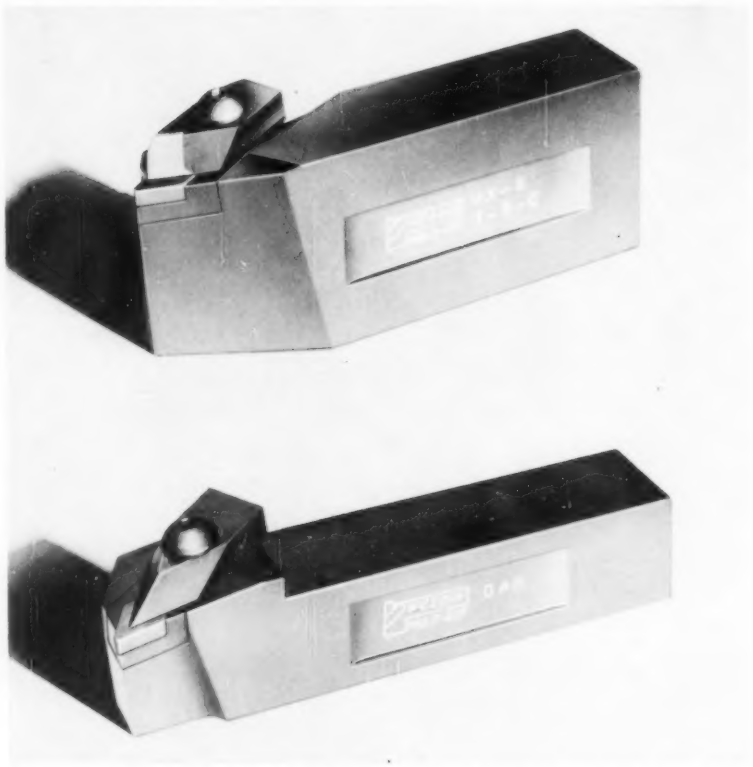
New "Poweramic" oscillating tool grinder is described in a 6-page, 3-color bulletin just released by Wesson. Designed for offhand grinding of standard and special single point carbide tools, the grinder takes the skill and effort out of grinding carbides, boosts output and gives finer finishes.

The oscillating wheel moves through a true arc at 150 strokes per minute, tool being held in a fixed position. Faster metal removal, hone-like (double cross-hatch) finishes and elimination of manual lateral tool movement are among features illustrated and described.

For full details on the Poweramic grinder write Wesson for Bulletin 56-A.




# New Holders Use Diamond Shaped Throw-Away Inserts



*Above is the MX-8-T5C holder specially designed for production copy turning lathes. Below is the right hand (DAR) model for plunge turning and facing.*

Three new holders for throw-away inserts have been added to the Wesson Multicut line. All three tools use Wesson standard diamond shaped D-55 throw-away inserts. The holders, designated as semi-standard, mount the insert right hand (DAR), left hand (DAL) and centrally (MX-8-T5C).

All features, including method of locking and clamping, use of adjustable chip breaker clamp, anvil relieved for built-up edge, etc. are similar to those in the standard line of Multicut holders.

DAR and DAL holders are particularly suitable for plunge turning and facing operations. The MX-8 type is designed for use on various production copy lathes and, on machines of this type, frequently eliminates subsequent finish turning or grinding operations.

Each insert used in any of the three holders in this series has four cutting edges. It is indexed progressively and discarded after all edges are used up.

For additional details on these holders ask for Bulletins DAR-DAL and MX-8.

tools Wesson carbide Wessonmetal

WESSON COMPANY DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 LEICESTER AVE., TORONTO 18, ONTARIO

# INCREASE GEAR SHAVING OUTPUT *with* VERSATILE SEMI-AUTOMATIC LOADING




**The operator handling a conventional rotary gear shaving machine is required to make 7 separate motions for each work part shaved.**

**With semi-automatic loading this is reduced to just 3 operations.**

1. **Place work gear on the pre-locater.**
2. **Press the start button.**
3. **Remove the shaved gear.**

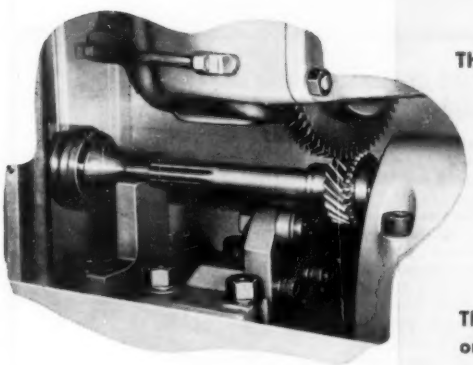
**The rest of the cycle is automatic.**

**Results are:**

- **Higher production**
- **Lower machining costs**
- **Less operator fatigue**
- **All the versatility of conventional shaving**
- **Greater safety**
- **Operator has ample time to serve 2 or more machines**

**The approximate work locater and head and tailstock centers or plugs are the only work part changes that are additional to a conventional gear shaver.**

**Red Ring Shaving Machines, Models GCU and GCI may be equipped with this equipment.**



*Write for Estimated Savings on Your Particular Operation.*

**Plastic Splash-Guard Used for Demonstration Only.**



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

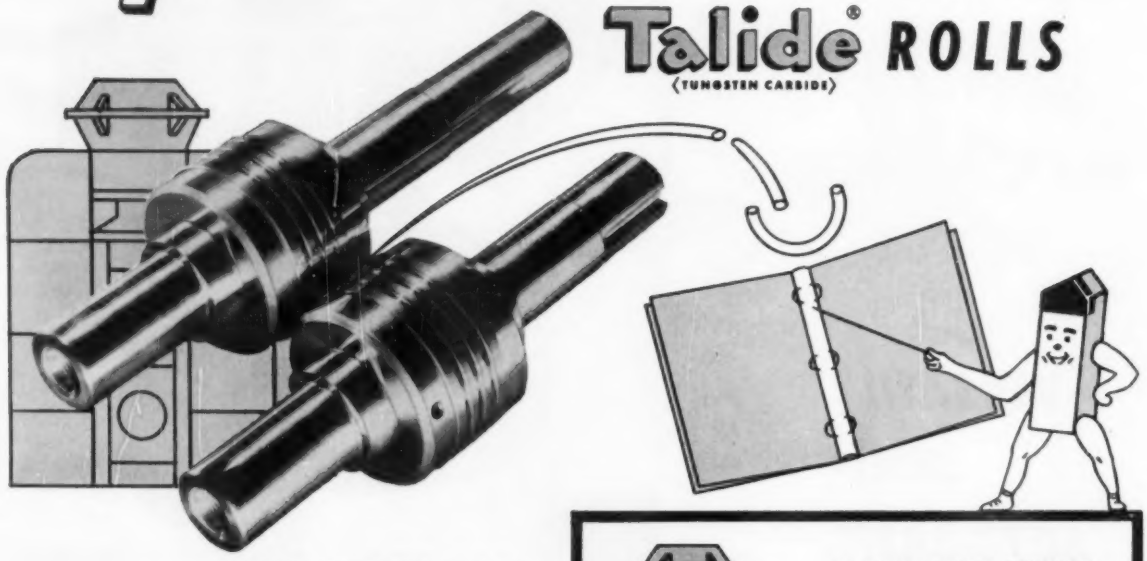
## NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

7388 *WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT*

# 7 years' continuous service with Talide® ROLLS

(TUNGSTEN CARBIDE)



● A large Eastern Producer of oval-shape wire for loose-leaf notebook rings was experiencing excessive wear and pick-up. The high scrap rate was making the item unprofitable. Metal Carbides service engineers were called in to determine if Talide rolls could correct the trouble. Hi-carbon wire was being reduced on a 2-hi cold rolling mill to an oval shape .100" thick x .156" wide. Considerable stress and pressure was required to deform the wire to proper shape.

Our engineers designed a roll incorporating a carbide sleeve having 3 grooves ground in periphery and mounted to a special alloy steel arbor. The initial pair of rolls was installed in 1948 and has been in continuous service ever since. Due to their extreme hardness it has not been necessary to remove them from the mill during this 7-year period—not even for a regrind! Size and shape of wire has been perfectly maintained. Customer has since installed similar rolls on all their mills.



## 40 TIMES MORE TONNAGE

Large Steel Producer cold rolls forty 3,000 lb. coils (60 tons) of 18-8 stainless steel, series 300, on 4-hi mill with one pair of solid Talide rolls with no surface wear, even though strip work hardens to 50 Rockwell "C" in one pass. Flatter, smoother strip produced—even when rolling intermittent widths. 40 pairs of steel rolls were required previously to produce same tonnage.

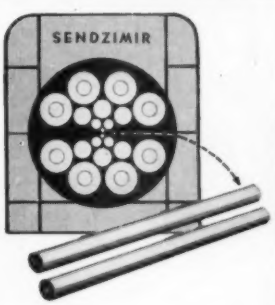
## SUPERSET GRINDING WHEEL



The Superset diamond grinding wheel was specially developed for grinding carbide rolls to highest possible surface finish and luster. Made of 4-8 micron size diamond dust, it imparts a surface finish far superior to any other commercial wheel. Available in sizes up to 25" diameter.

## ROLL LIFE INCREASED 278 to 1!

All users of Sendzimir rolling mills have adopted Talide work rolls because operating results have been phenomenal, far surpassing all expectations. Tremendous production runs are commonplace with mill after mill reporting increased tonnage runs between roll changes of 278-1, 179-1, 82-1, etc.




## EXCLUSIVE REPAIR SERVICE



BEFORE



AFTER

Broken or damaged carbide rolls can be re-worked to first class condition with all defects eliminated at one-half original cost. Only Metal Carbides offers this service—because of its exclusive hot press method.

Metal Carbides Corporation,
Youngstown 12, Ohio.

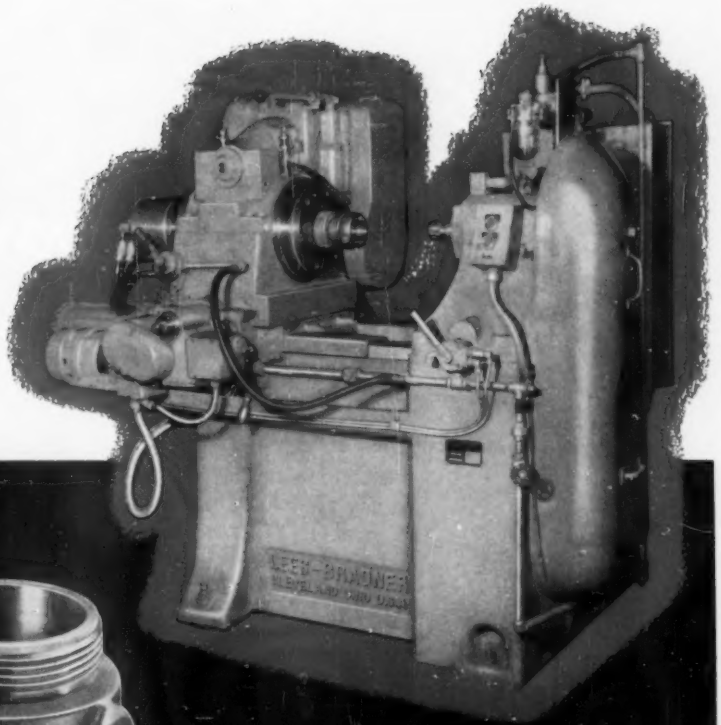
**Send for new 84-page catalog 56-G**

Talide Rolls are made in lengths up to 100", diameters up to 25", and up to 5000 pounds by weight.

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

# It took this HIGH-SPEED Heavy-weight to lick this tough job!





The Lees-Bradner Special High Speed Thread Milling Machine

The Lees-Bradner Special Thread Milling Machine really shows its class when it works with brass!

The Akron Brass Manufacturing Company of Wooster, Ohio produces these threads, internal and external, each in 13 seconds with a 5000 RPM cutter spindle speed.

This is just one example of the many threading jobs that the modern, high speed, Special Thread Milling Machine can do better, faster and with unmatched precision.

Write The Lees-Bradner Company for full information on this remarkably versatile machine.

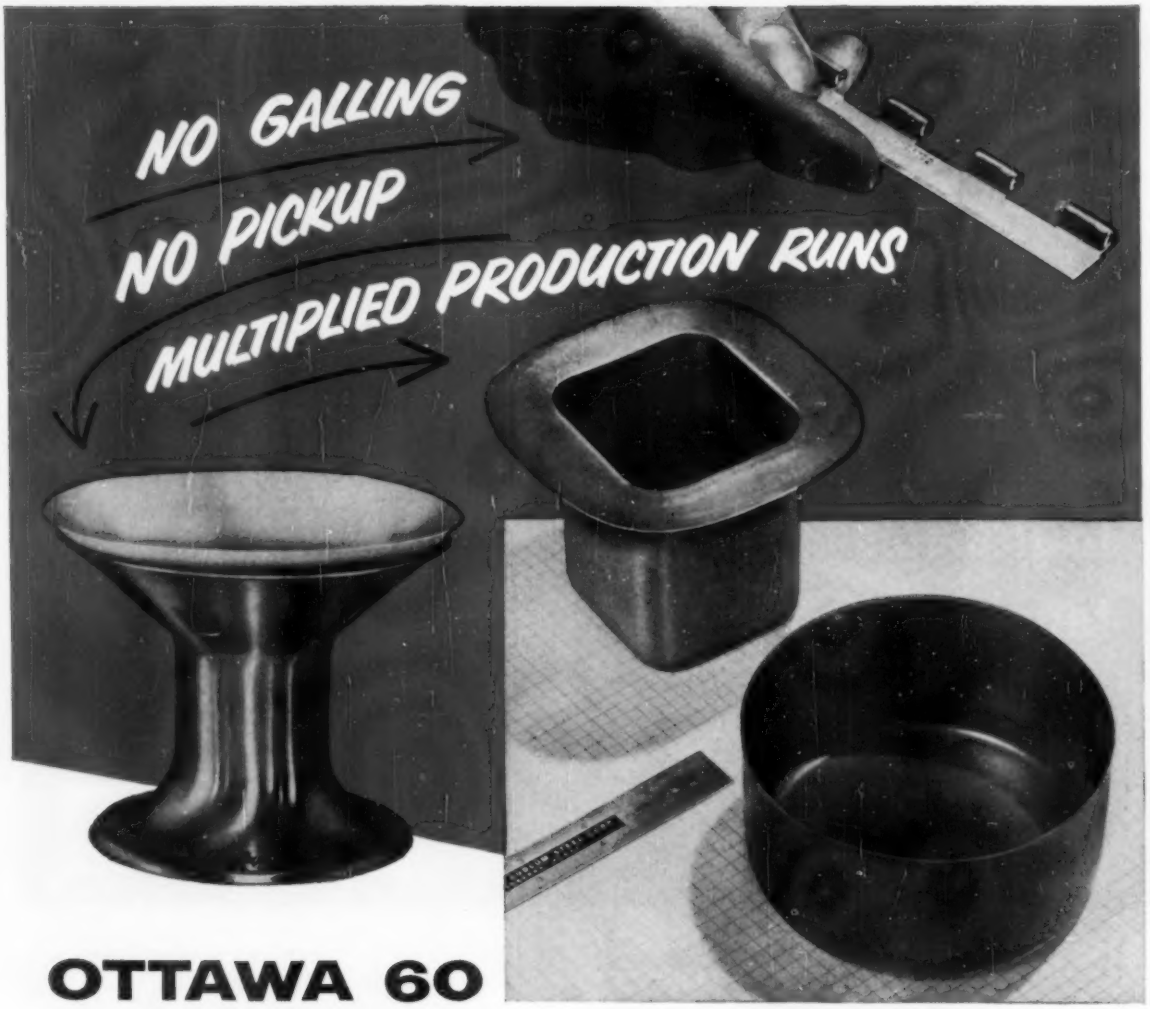
**DETAILS ON THIS JOB**

Hob Spindle Speed, 5000 R.P.M.
*(Using a high speed cutter spindle)*

| | |
|---|---|
| Thread Pitch (internal and external) | 7½ |
| Thread Diameter | 3" |
| Length of Thread | ¾" |
| Threading Time | 13 seconds |
| Material | Brass |
| Weight of Parts | |
| Internal thread | 1 lb. 13 oz. |
| External thread | 2 lb. 10 oz. |

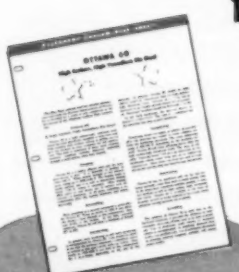
the LEES-BRADNER Company

CLEVELAND 11, OHIO • U.S.A.




# OTTAWA 60

## for DRAW DIES is *PRODUCTION NEWS!*



**Write for a copy of the OTTAWA 60 BLUE SHEET**

This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.

**ADDRESS DEPT. TE-79**

In fact, this exclusive Allegheny Ludlum-developed die steel is mighty *good* news for any user of draw dies. Ottawa 60 is a high-carbon, high-vanadium analysis, initially designed for the primary purpose of drawing stainless steel.

In that service, Ottawa 60 does just exactly what it was developed to do: it performs without galling or pickup, and shows exceptional wear-resistance—as a long list of successful applications will prove to you. Two of them are illustrated above: a stainless hinge and a stainless sundae server.

*But Ottawa 60 is a top performer on any draw die application!* Also illustrated above are the two draws on a transformer housing of .037″ gauge SAE 1010 strip. After more than 25,000 pieces—*over 12 times any previous runs*—there was still no sign of pickup, or of wear on the Ottawa 60 punch or die.

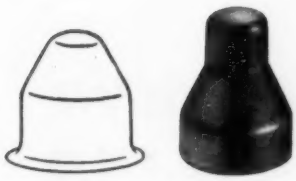
This analysis can solve your draw-die problem jobs—or reduce your costs on almost any drawing operation. ● Call on our Mill Service Staff for any assistance. ***Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.***

For complete **MODERN** Tooling, call

# Allegheny Ludlum

WSW 5581 A

AL® FINE TOOL STEELS SINCE 1854



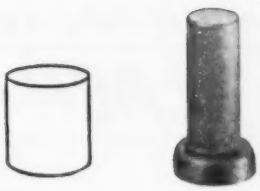
**PREFORM** 1 11/16" dia. 1 13/16" high
**FINAL FORM** 1 11/16" dia. 2 1/4" high

**2 OPERATIONS** plus anneal—.032" AMS 5521. Jet engine part formed by redrawing a cup.



**PREFORM** 3 1/4" dia. 3 1/4" high
**FINAL FORM** 2 7/8" dia. 5 1/8" high
**PREVIOUS METHOD**

**2 OPERATIONS**—.043" AMS 5540. Jet engine part formed by redrawing a cup. Part at right shows previous forming method of welding two stamped sections together.

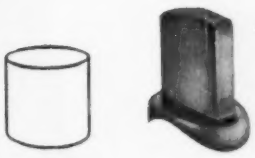


**PREFORM** 1 1/2" dia. 1 3/4" high
**FINAL FORM** 1 5/16" dia. 2 3/8" high

**2 OPERATIONS**—.020" Hy Mu 80. Part formed by redrawing a cup.

# Hydroforming

*takes less time, less dollars to form tough shapes, tough metals*



**PREFORM** 1 5/8" dia. 1 1/4" high
**FINAL FORM** 1 3/4" long 1/2" wide 1 1/2" deep

**2 OPERATIONS** plus anneal—.025" Brass. Instrument cover formed by drawing a cup into the final rectangular shape.

■ Shown here are several parts drawn on Cincinnati Hydroform machines. These range from tough shapes of ductile materials to less complex shapes of harder-to-work alloys. In each instance, Hydroforming substantially reduced the number of operations required to form the part conventionally . . . used simple tooling, costing from 25% to 90% less than conventional tools . . . and produced a part of higher quality.

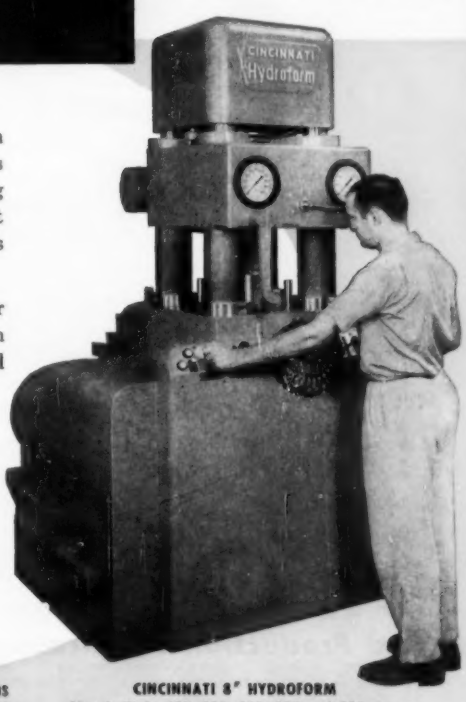
These advantages—better parts, in fewer operations, at lower costs—can be yours by Hydroforming. Let a Process Machinery Division field engineer give you full details. For a description of the process and specifications of the six machine sizes, write for Bulletin M-1908.



**1 OPERATION**—.030" Brass. Automotive detail.



**1 OPERATION**—.034" CRS, deep-drawing quality. Previous forming method required drawing the can, cutting a slot in the wall and welding on the protruding section.




**CINCINNATI 8" HYDROFORM**
Also built in 12", 19", 23", 26" and 32" sizes.

CINCINNATI **Hydroform**

PROCESS MACHINERY DIVISION
**THE CINCINNATI MILLING MACHINE CO.**
CINCINNATI 9, OHIO, U. S. A.

MICROBORE

# FLASH CHANGE® the ultimate in QUICK CHANGE TOOLING




***For General Purpose Work and Production Applications . . .***

- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.

*Write for illustrated Flash-Change Catalog*

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2719 West Fourteen Mile Rd., Royal Oak, Michigan

## Why limit yourself to "STOCK" sizes?

# Hannifin can ship the cylinder you need within 48 hours!

(NEW AND EXPANDED PRODUCTION FACILITIES MAKE THIS POSSIBLE)

## Any mounting style in:

Series "A" Square Head Air Cylinders—1½" to 14" bore
Series "H" Square Head Hydraulic Cylinders—1½" to 8" bore
Series "LW" Cast Head Air Cylinders—1" to 12" bore

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As specified to 60"

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Catalog standards, including standard alternates.
Most special rod ends require only 24 hours longer.

**Cushions**
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Experienced sales engineers
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Series "H"
Hydraulic Cylinders

BULLETIN 213—
Series "A"
Air Power Cylinders

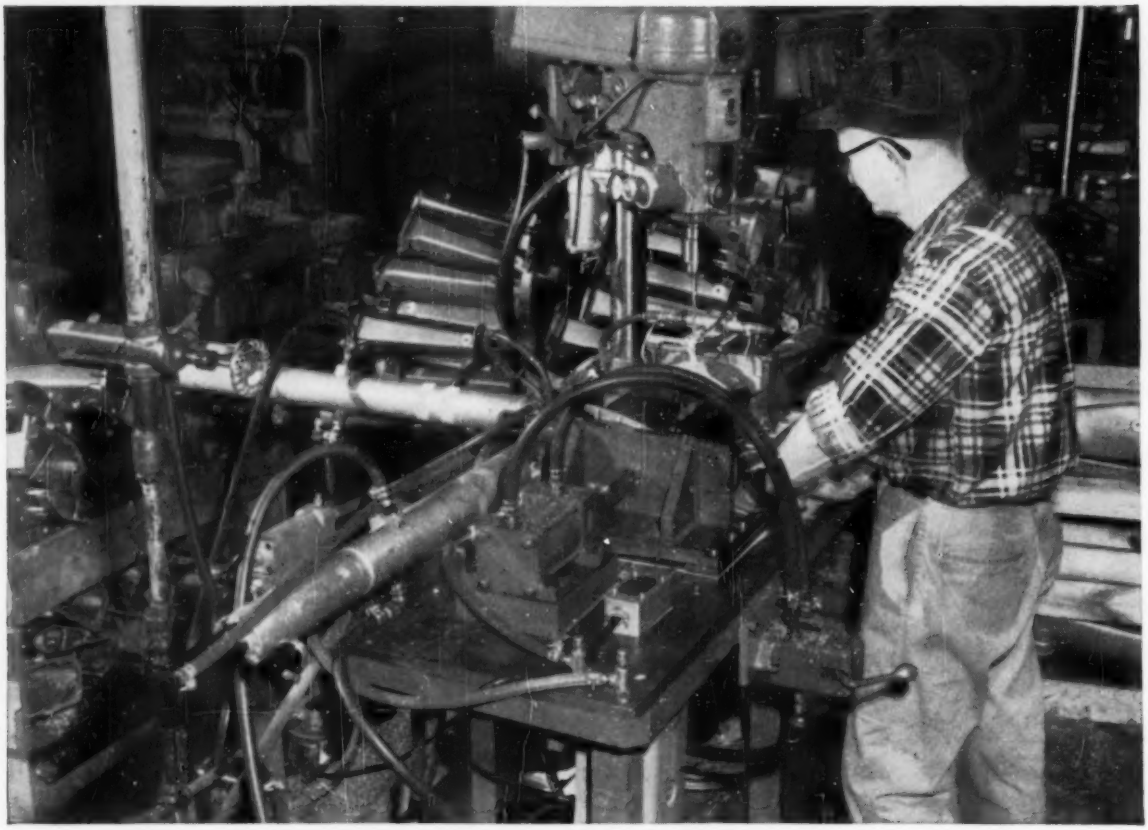



Write for your copies

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Hannifin Corporation, 519 S. Wolf Road, Des Plaines, Ill.
Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

**Gardner-Denver...** Serving the World's Basic Industries

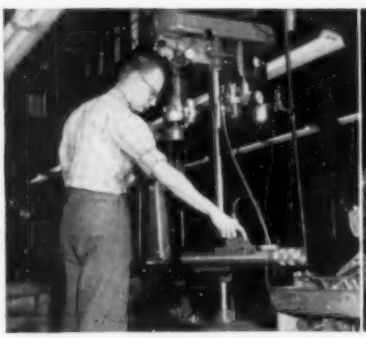


At this drill press station, four Keller Tool "Airfeedrills," with five-, six- and eight-inch strokes, drill four extra holes in the workpiece as the drill press finishes one hole from above.

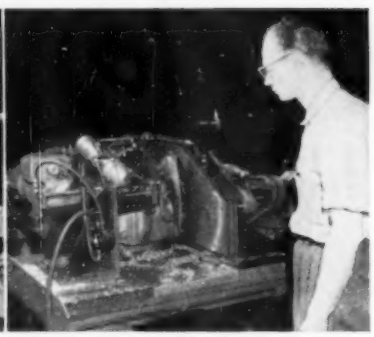
## Drills 4 extra holes . . . production time: zero!

Production men have found a new and ingenious way to complete drilling operations with no extra production time. When a workpiece has to be jigged or put in a drill press for some operation, they mount Keller Tool "Airfeedrills"® in position to perform additional drilling, reaming, tapping or facing operations at the same time. The illustrations on this page show how it's done.

Ideal for mounting in multiple units or as single outriggers, Keller Tool "Airfeedrills" and "Airfeedtappers"® perform complete work cycles automatically—at the press of a button. Further details are available in Bulletin 92.



Operator presses a button—and the Keller Tool "Airfeedtapper" provides a free tapped hole while standard machine taps three holes at top of piece.



While special multiple head unit drills eight holes in the work, an "Airfeedrill" mounted at rear of fixture step drills a "free" ¼-⅜-inch hole at an odd angle.

**GARDNER - DENVER**

**KELLER TOOL division, Grand Haven, Michigan**

THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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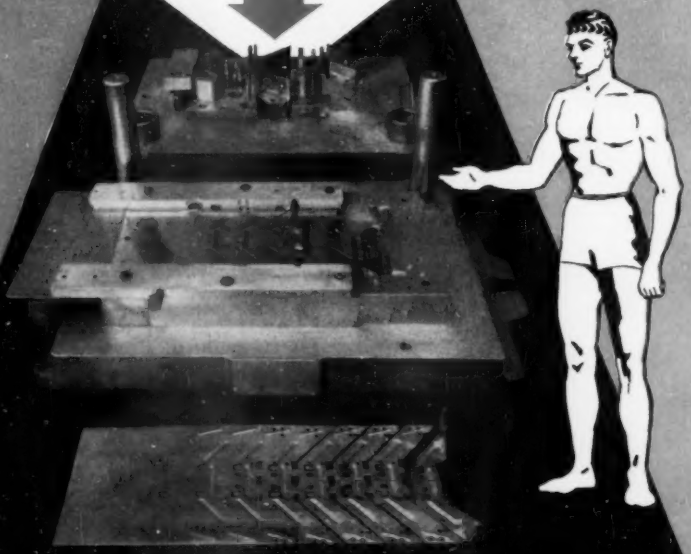
*Here's why . . .*

**Mason, Shaver & Rhoades, Inc.**
East McKeesport, Pa.

*used* **DESEGATIZED®**

# Olympic FM

**DIE STEEL**
**for this die**



Eight-station progressive die made from Olympic FM by Mason, Shaver & Rhoades, Inc. Die is used to produce mounting brackets for lighting fixtures from .041 cold rolled steel.

1. Olympic FM is easier to machine, especially in milling and shaping.
2. Olympic FM produces a better finish and does not tear.
3. Improved tool life noted when using Olympic FM.

● Latrobe's Olympic FM high carbon-high chromium die steel has consistently produced superior machined finishes, lowered die production costs, and resulted in longer production runs than comparable type die steels. One of Latrobe's many DESEGATIZED® steels, Olympic FM is a free machining die steel . . . its improved free machining characteristics resulting from the addition of alloy sulphides uniformly dispersed by the DESEGATIZED® process of manufacture.

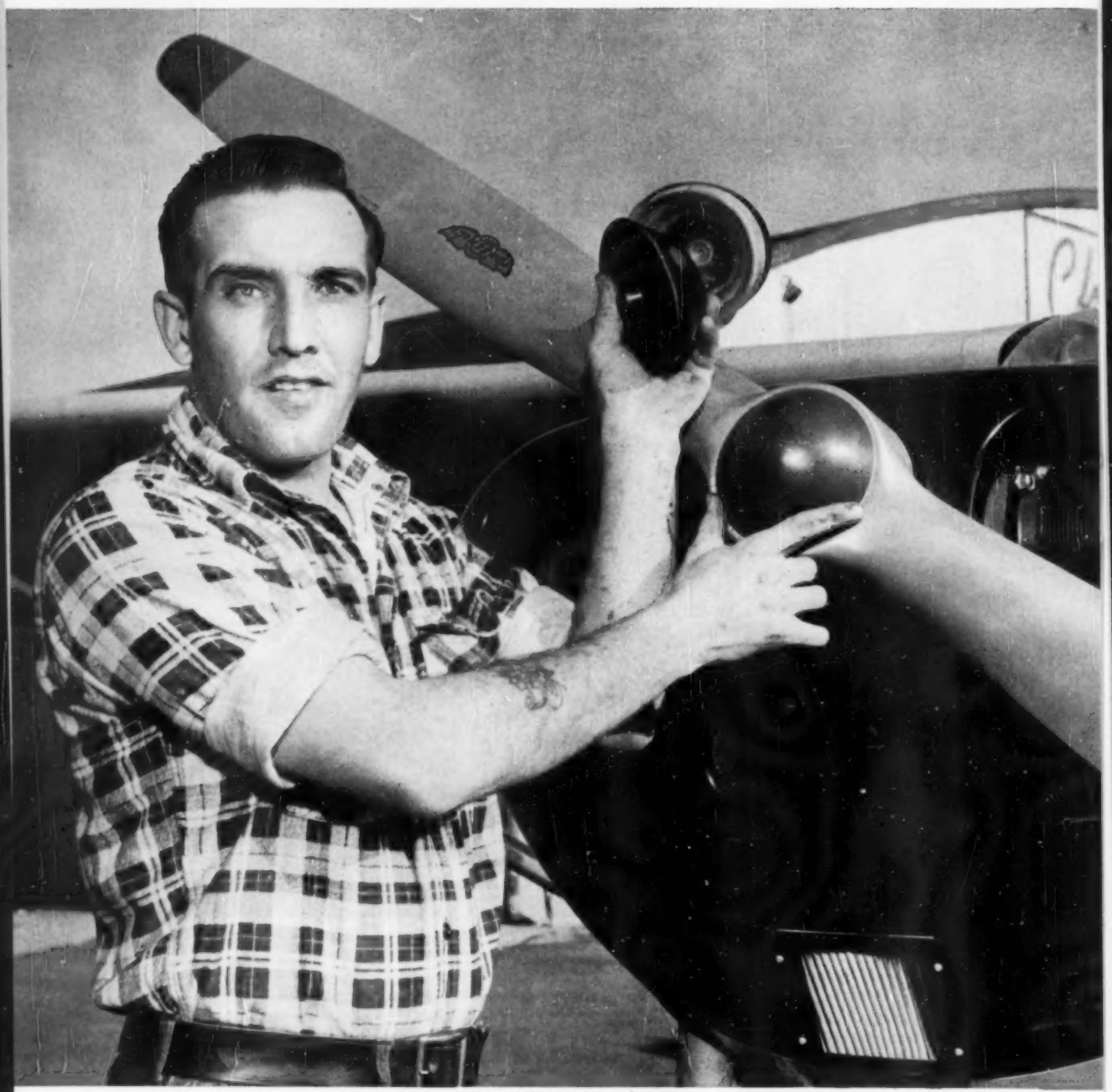
*Specify Olympic FM for your next die . . . over 250 sizes stocked in conveniently located warehouses throughout the country.*

## LATROBE STEEL COMPANY

**LATROBE, PENNSYLVANIA**
Branch Offices & Warehouses Located in Principal Cities

*Another Opportunity Chemical from General Mills*

# Tough, low-cost plastic easy to make with



*Plastic lathe fixture, left, is used to make propeller spinners at Champion Aircraft Corp.*

***Investigate Versamids the versatile polyamide resins made only by...**

## CHEMICAL DIVISION

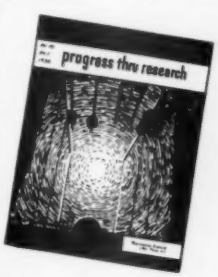
# tools and dies are Versamid*-epoxy alloys!



**Strong, lightweight plastic tools** have passed rigid, practical tests and are in daily use in aircraft, automotive and other industries. Champion Aircraft Company of Osceola, Wisconsin is one of many manufacturers who have found Versamid-epoxy alloy tooling economical, efficient and a valuable aid to their business. Thermosetting alloys of Versamid-epoxy resins are being used to produce aluminum and even heavy gauge steel stampings. These alloys show high impact strength, are extremely easy to work with, and can be formulated to yield almost any set of properties desired.

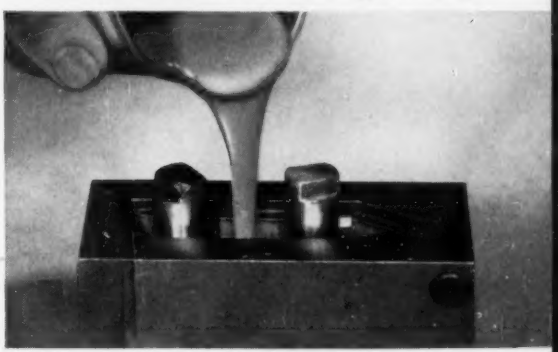
**Maybe tools and dies aren't your problem,** but chances are you can use Versamid polyamide resins to save time and money in other applications. Tough industrial finishes, plastic body solder, structural adhesives, rugged plastic laminates . . . these are but a few of the known and tested uses for versatile Versamids. Only Versamid polyamide resins do so many jobs so well, and only General Mills makes Versamids.

**Write for free booklet.** The Spring issue of General Mills magazine, *Progress Thru Research*, contains a fact-filled article on plastic tooling. If possible, name your needs for specific information on the application you're considering. Write General Mills Chemical Division, Department TE-7, Kankakee, Illinois.

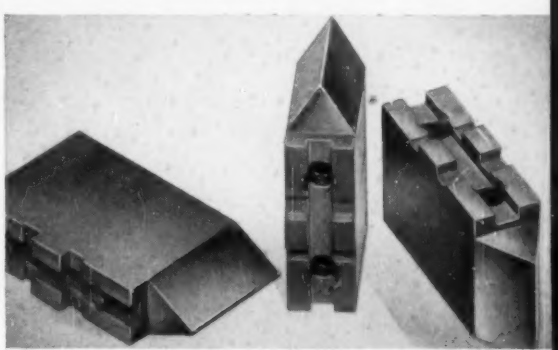



**Please note that General Mills** does not market plastic tool and die alloys . . . only the Versamid polyamide resins used in such alloys.

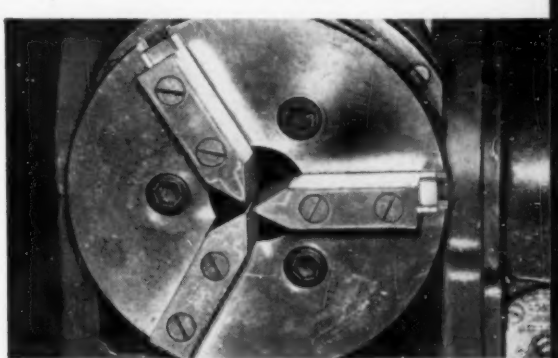
**Versamids* Make Plastic Tooling Practical**



**1.** Here an alloy of Versamid 125, epoxy resin and aluminum powder is poured into a brass mold.

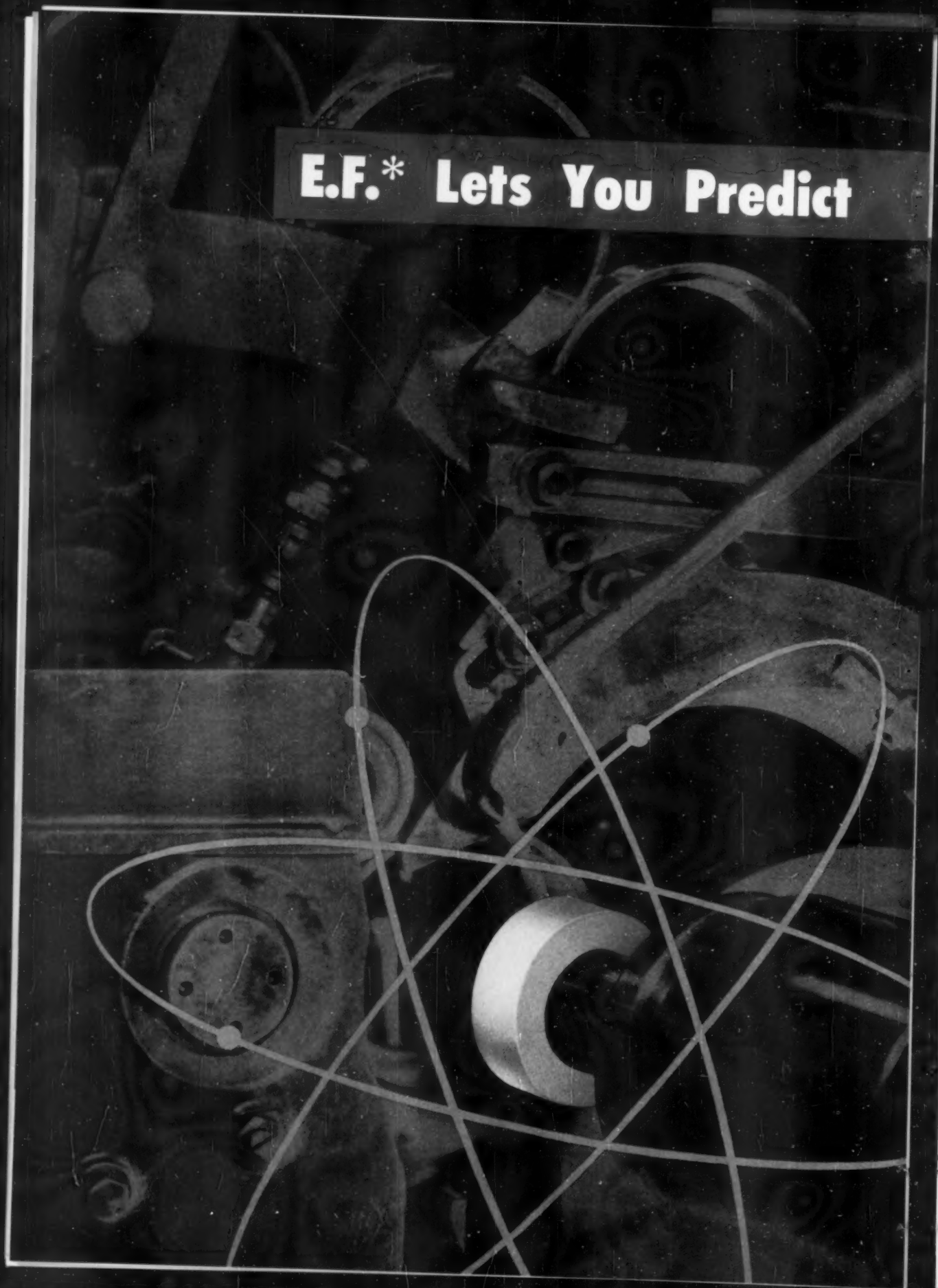


**2.** These soft jaws, or chucks, are molded from Versamid-epoxy alloy at extremely low cost.



**3.** Finished three-jaw chuck in regular use on lathe in precision machine shop.

**OF General Mills** KANKAKEE, ILLINOIS


E.F.* Lets You Predict

# Grinding Wheel Performance

***ELECTRONIC FORMULATION is a basic manufacturing improvement which makes grinding wheel accuracy equal to the precision of automated production.**

When the output of machines like this centerless internal grinder feeds a production line . . . grinding wheels *must* maintain their prescribed production rates!
BAY STATE'S "EF" lets you predict such dependable grinding action because it offers:

GREATER ACCURACY **in selecting the right wheel for the finish and production rate you need.**
"EF" is based upon a new, straight-line progression of wheel hardnesses and structures. Specifications can be pin-pointed on this basic line within much closer tolerances.

GREATER DEPENDABILITY **of cutting life, giving a more reliable basis for predicting production per wheel.**

"EF" uses the unerring accuracy of an electronic "brain" to calculate *precise* amounts of each ingredient. These determine the grade and structure, hence the *performance* of the finished wheel.

GREATER UNIFORMITY **in cutting qualities of replacement wheels, for continuous production at most efficient rates.**

"EF" retains essential formula figures in the perfect "memory" of electronically punched cards. This assures identical duplication of materials in reproducing the wheels prescribed for your needs.

GREATER CONSISTENCY **in grade and structure, for steady flow of parts at "within tolerance" finish and dimensions.**

"EF" has established the most accurate standards by which grinding wheels can be specified, produced, and reproduced. It is your most logical source of complete confidence in production grinding wheels.

**Get ALL the E. F. benefits**
**See your BAY STATE Distributor!**

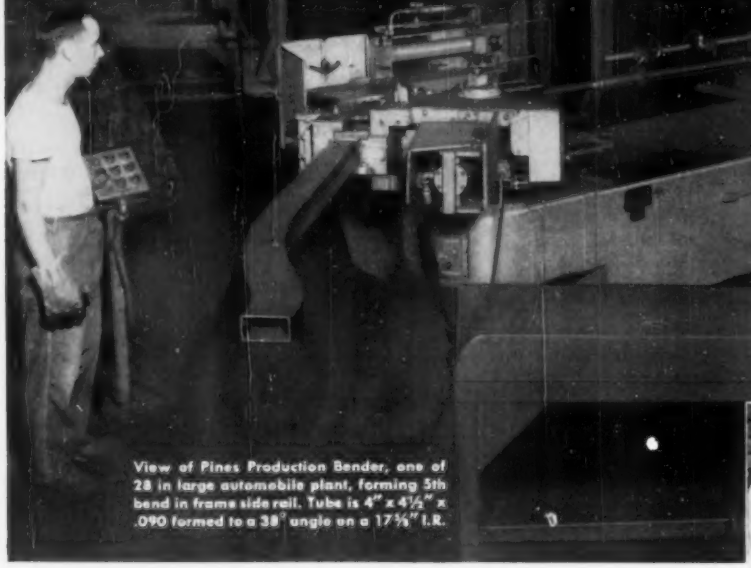



BAY STATE
WHEELS of PROGRESS

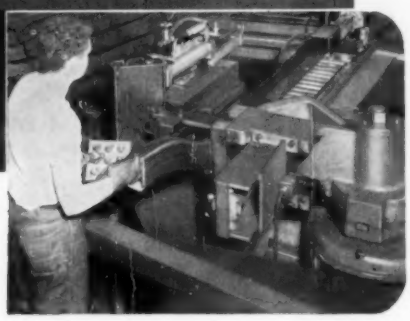
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# *Now*-COLD BENDING THE "PINES-WAY" PRODUCES MORE ACCURATE AUTOMOBILE FRAMES



View of Pines Production Bender, one of 28 in large automobile plant, forming 5th bend in frame side rail. Tube is 4" x 4½" x .090 formed to a 38° angle on a 17⅝" I.R.



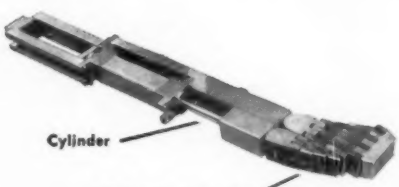
▲ Close-up view of machine used to produce 4th bend in long side rail member. Five different bends are made in this piece, each in sequence on separate machines. Accuracy is held within .030" to .045" at seven check points. Spring-back is easily controlled by simple stop settings — an important factor that cuts tool costs.

## Production Bending Methods Simplify Fabricating Problems, Cut Assembly Costs

● The unusual versatility of Pines Bending Machine methods is again demonstrated by the successful production line application shown above in a large automobile manufacturer's frame plant. Proven by more than 18 months of operation, a battery of 28 special Pines Benders are now forming .090 tapered welded steel tube frame members at a rate of 120 bends per hour. These machines and ingenious tooling, designed and built by Pines, form a total of seven bends in each side rail member and produce more accurate parts than ever before possible. The end result is a stronger, more accurate chassis that is much easier to assemble to the car body.

### Typifies Progress in Cold Bending Techniques

This revolutionary new manufacturing method is the result of long months of cooperative efforts between Pines and automotive engineers. It is typical of the consistant progress being made in profitable application of cold bending in the manufacture of a wide variety of metal products. It may also pay you to investigate the design possibilities and the production advantages of cold bending the "Pines-way." At your first opportunity call in our Sales Engineers for free survey.




▲ View of a flexible articulate mandrel used for making a bend at a right angle to, and within, a previously bent section. Mandrel is automatically inserted and expanded. Insures smooth, neat bends.



*Write* FOR MORE DATA

If you would like case study data on production bending, write today for free copies of Pines News.

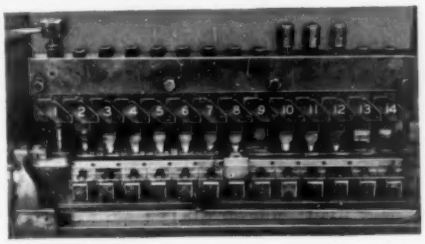
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Specialists in Tube Fabricating Machinery

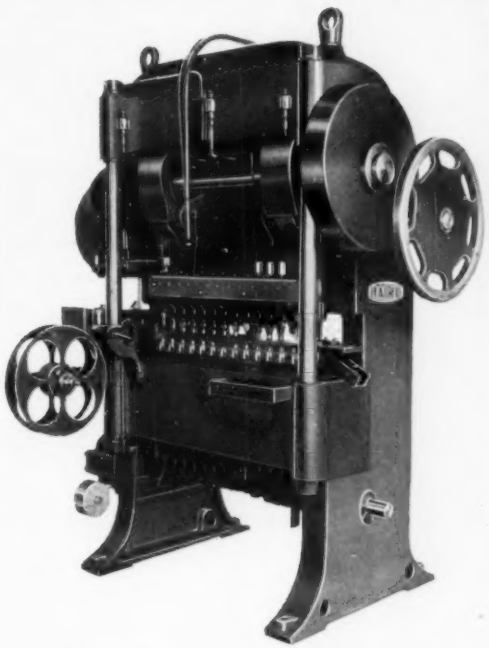
693 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

# ...ask BAIRD about it



A complete die set with full complement of punches and dies in working position and with transfer in loading position. Note accessibility of all mechanisms and adjustments.



## What is so different about BAIRD Multiple Transfer Presses

Many still confuse these advanced high production machines with multiple-slide presses (commonly called eyelet machines) or with equipment using progressive dies.

They are, in fact, entirely different . . . and the advantages of Baird design result in much more flexible and versatile tooling . . . much less down-time for initial tooling, maintenance and change-over . . . use of minimum width stock . . . maximum production speeds smoothly maintained.

In addition, Baird Multiple Transfer Presses can maintain closer tolerances than previous methods on high production of parts requiring from 8 to 15 consecutive operations.

So smoothly do these machines operate that old-time press-room clatter is a thing of the past. Normally, long production runs at high speed may be maintained without adjustment down-time.

If you are looking for the most modern equipment available for volume production of press-produced parts . . . by all means "ask Baird about it." Our development of the Baird Automatic Multiple Transfer Press has set many new standards in this field. Write Dept. TE.

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS

THE BAIRD MACHINE COMPANY

STRATFORD CONNECTICUT

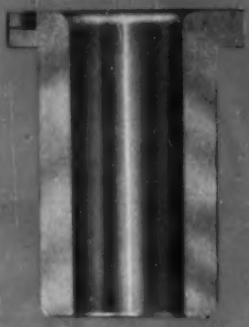
28A56

for accuracy in your production
it pays to specify

# UNIVERSAL DRILL BUSHINGS

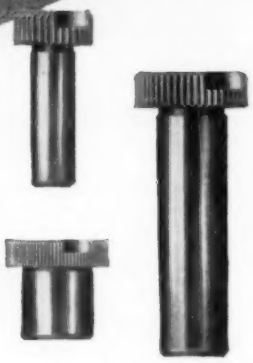


In Universal you get the best. Machined from finest quality steel. Blended radius on the top-inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



**superfinish bores lengthen tool life**

The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum—especially in close tolerance work.

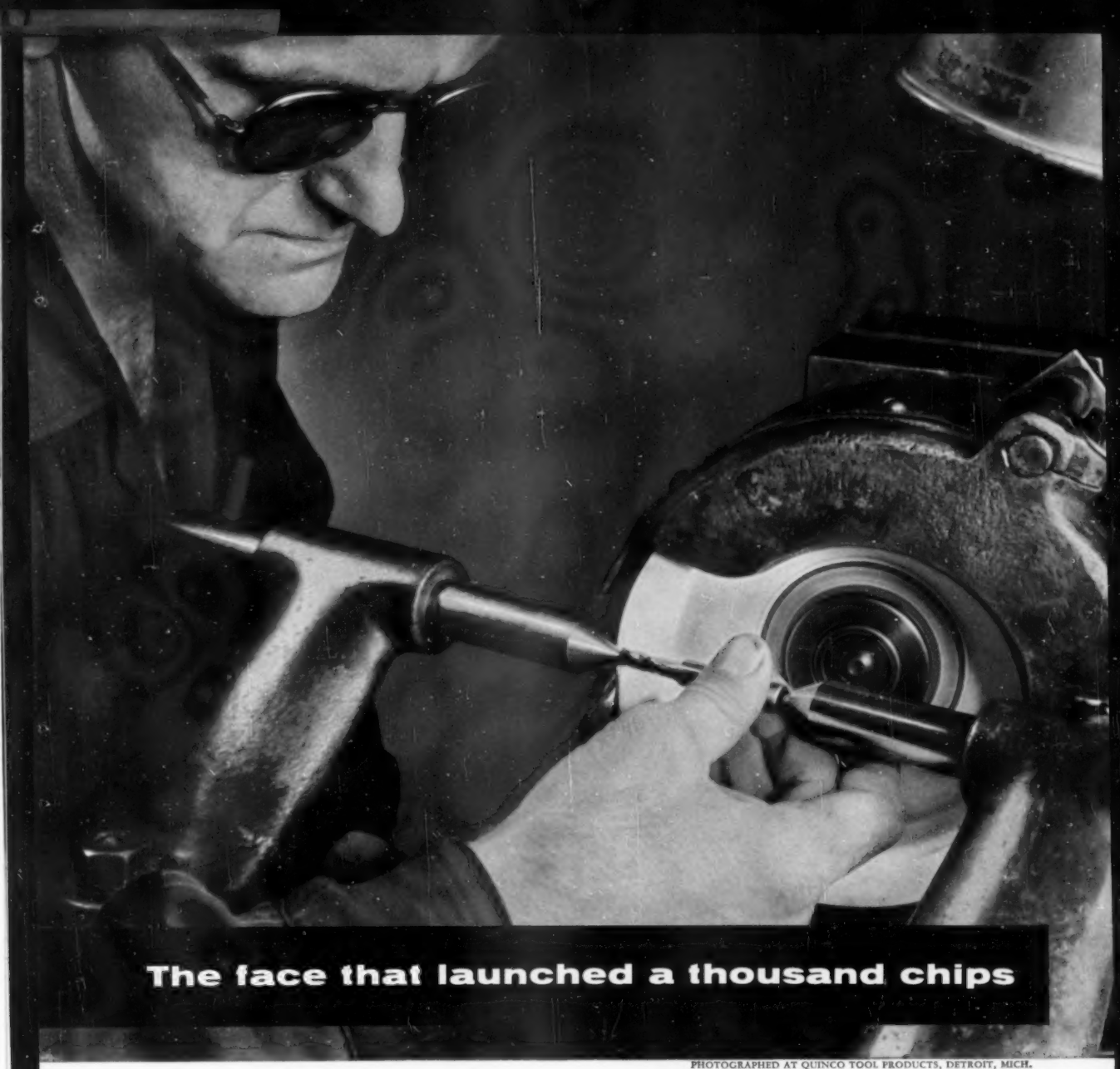


Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.




Write for your copy of our new 98 page catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Holders, Mikro-Lok Boring Bars, Standard Drill Bushings, Universal Index Plungers and other Universal products.

**UNIVERSAL ENGINEERING COMPANY** | FRANKENMUTH 3, MICHIGAN



# The face that launched a thousand chips

PHOTOGRAPHED AT QUINCO TOOL PRODUCTS, DETROIT, MICH.

"Better finish—much cooler cutting —three times the production." This report on "V40" Bond Tool Room Wheels is typical of thousands received at CARBORUNDUM from tool rooms in every state of the union. Roughing end mills, finishing reamers, profiling multi-tooth cutters, backing off broaches, sharpening hobs...no matter what your job...*one* bond, "V40", will serve you better than any other. Wheel structure and bond combine to make "V40" wheels hold form and size longer than any other tool room wheels—cut costly down-time for dressing midway through a job. Yet the composition of the bond is such that "V40" wheels dress quickly and easily when necessary. Call your CARBORUNDUM Distributor or salesman for a trial, and see how easy "V40" wheels are to use . . . with profit! For performance reports on tool room grinding, write The Carborundum Co., Niagara Falls, N. Y. In Canada: Canadian Carborundum Co., Ltd., Niagara Falls, Ont.

**Through application "know-how" and product quality**

# CARBORUNDUM

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**continually puts more sense in your abrasive dollar**

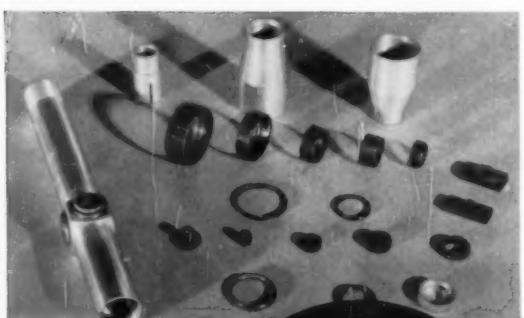
# BULLSEYE ACCURACY

for rifle sights

assured by




## Warner & Swasey Precision Tapping Machine



**WARNER & SWASEY PRECISION TAPPING & THREADING MACHINES**

**No. 10**
0-80 to 10-24 Capacity

**No. 11**
8-36 to 7/8" Capacity

**No. 11 RS RADIAL**
(Single Head)
**No. 11 RD RADIAL**
(Double Head)
8-36 to 7/8" Capacity

**No. 12**
3/8" to 2½" Capacity

**WARNER & SWASEY**
*Cleveland*
PRECISION MACHINERY SINCE 1880

"TEXAN" telescopic rifle sights made by Norman-Ford & Company, Tyler, Texas, require high precision machining throughout for accurate optical alignment. That's why owner T. L. Ford says, "Thread cutting accuracy of our Warner & Swasey No. 11 Precision Tapping and Threading Machine makes it an essential part in the manufacture of our line of telescopic sights."

This machine with its exclusive *positive leading-on* principle—solenoid-actuated guide fingers operating on a hardened lead screw to guide the tap in and out—assures precision leading of the tap, and eliminates the possibility of shaving threads on the return stroke. This lead control is important at Norman-Ford because of the fine pitches in relatively soft 24-ST aluminum alloy and mild steel parts. 0-80 to 1⅝" threads are cut in retaining rings and lens cells, and windage and elevator adjusting screws. All threads are 48-TPI except for the 0-80 threads.

Since its installation in 1946, no downtime has been lost for repairs!

If your work calls for tapping of Class 3 and 4 threads on a production basis, call in our Field Representative to discuss how a Warner & Swasey Precision Tapping and Threading Machine can speed work, cut scrap loss, and increase profits for you.

**YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY**

**PowerGrip "Timing®" Belt**




**"For invention of high order and for particularly meritorious improvements and developments in machines and mechanical processes."**

These are The Franklin Institute's words in awarding its 1955 Longstreth Medal to the inventor of U. S. PowerGrip "Timing" Belts—the outstanding contribution to power transmission of the decade.

It's easy to understand why PowerGrip received this great award. By providing near-100% efficiency in positive, non-slip, split-second timing, it has become standard equipment on a wide variety of machines and appliances. The list grows daily.

U. S. PowerGrip Timing Belts—and descriptive literature—are obtainable from factory-trained engineers at any of the 28 strategically located "U. S." District Sales Offices or by contacting us at Rockefeller Center, New York 20, N. Y.



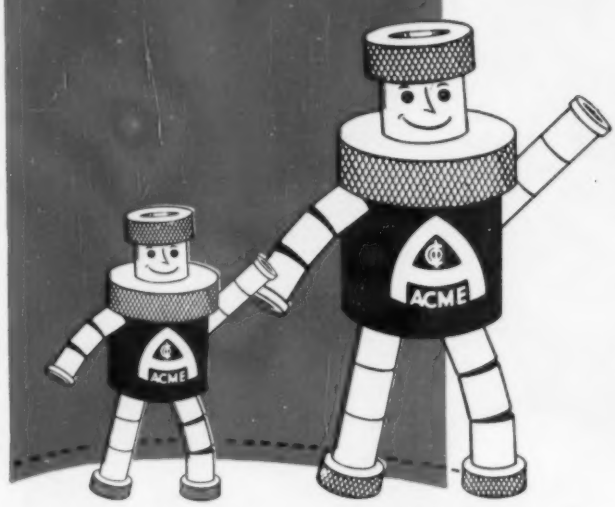
The Franklin Institute, founded in Phila. in 1824, is one of the oldest and most renowned scientific institutions. Its awards are made only after exhaustive studies of contributions to science.

Mechanical Goods Division

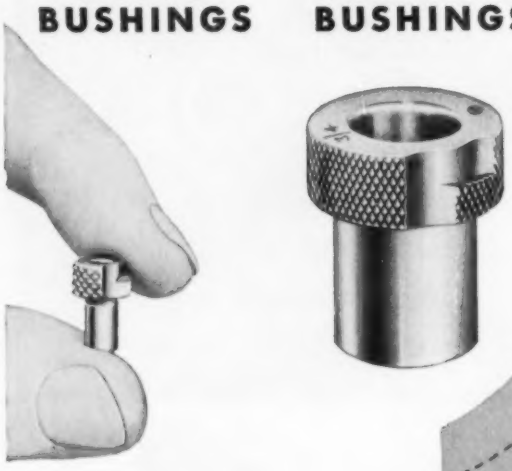
**United States Rubber**

*Now...a complete line of*

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## Drill Jig
# BUSHINGS




**MICRO BUSHINGS** **STANDARD BUSHINGS**



- ☆ Only ACME offers you two standards: A.S.A. and ACME – #80 to 2"
- ☆ Standard sizes from your local distributor's stock – *special sizes on request*
- ☆ Standard catalog tolerances
- ☆ FREE catalog and price list

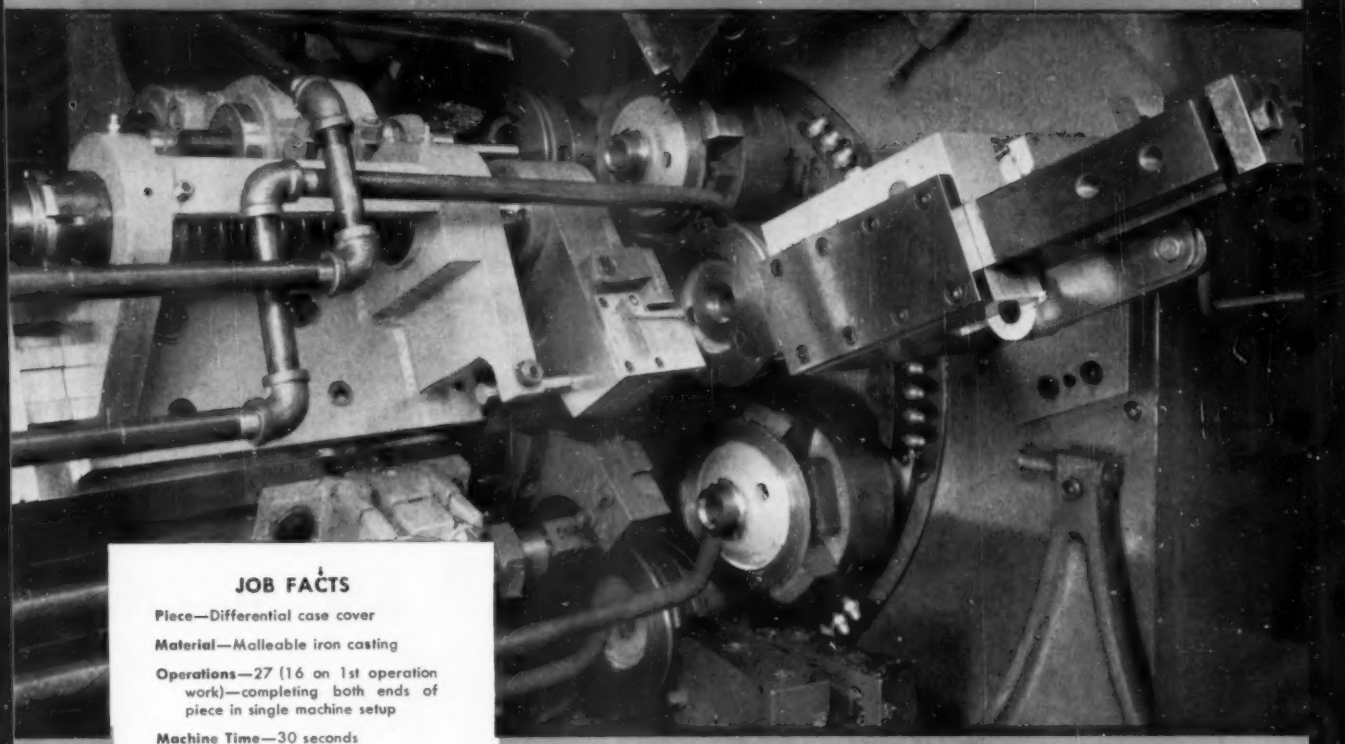
**Write for information and prices on micro, standard and tungsten carbide drill jig bushings, dowel pins, chamfer micrometer gages and portable bench centers.**

ACME

## ACME INDUSTRIAL COMPANY

**208 North Laflin Street • Chicago 7, Illinois • Phone MOnroe 6-4122**

# Acme-Gridley



**JOB FACTS**

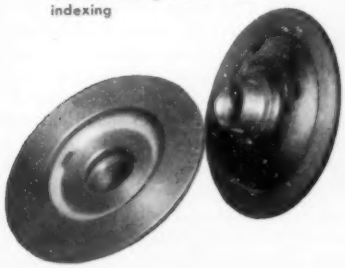
**Piece**—Differential case cover

**Material**—Malleable iron casting

**Operations**—27 (16 on 1st operation work)—completing both ends of piece in single machine setup

**Machine Time**—30 seconds

**Machine**—8"RPA-8 Acme-Gridley Chucker arranged for double indexing



**Write *today* for your free copy of 16-page illustrated bulletin CM-51A that shows and describes how Acme-Gridley 4, 6 and 8 spindle chucking automatics are designed to give you the maximum return on your investment.**

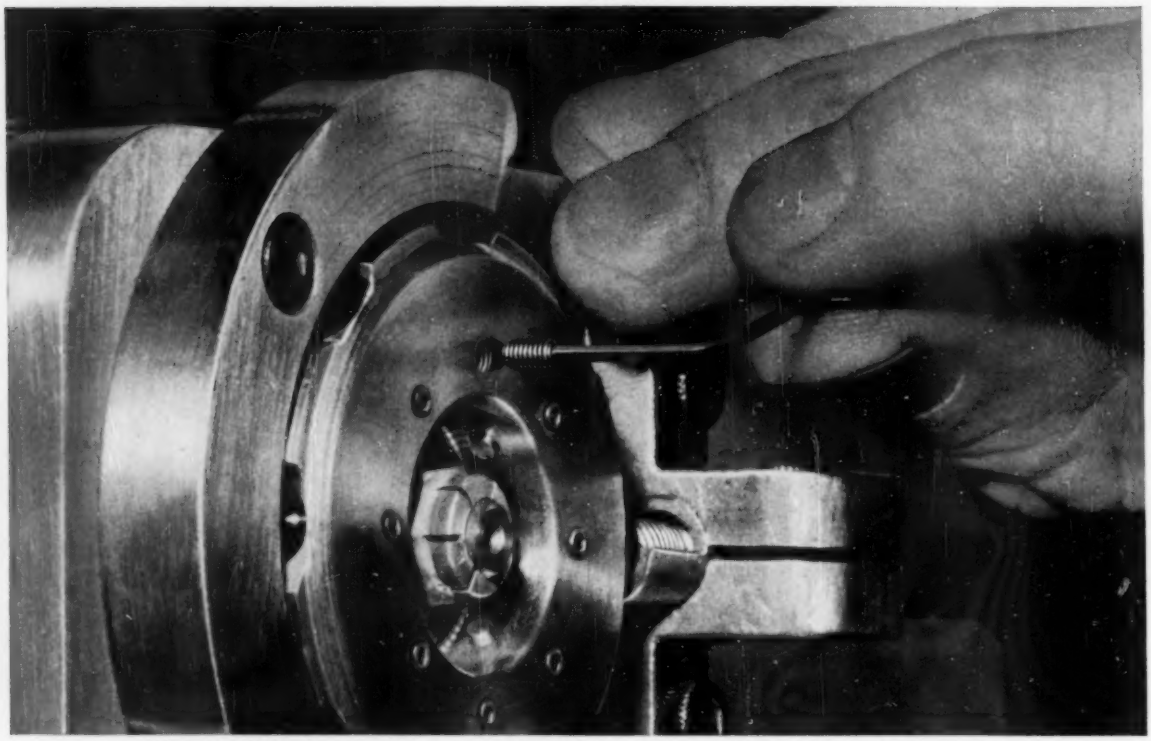
## minimizes the importance of the decimal point... maintains automotive quality control

Continuous quality control, so basic to modern automobile production, was implemented by this manufacturer when he chose Acme-Gridley multiple spindle chucking automatics to perform 27 operations on the piece shown at the left. This not only let him do more operations in a single machine setup but, because of Acme-Gridley inherent design for sustained accuracy at high speeds and feeds, gave him decimal point accuracy that remained within control limits for check lot after check lot. Thus he prevents costly production bottlenecks, reduces scrap and maintains a balanced flow of parts to final assembly points.

# National Acme

THE NATIONAL ACME COMPANY, 184 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark 2, New Jersey • Chicago 6, Illinois • Detroit 27, Michigan



**Microsize UNBRAKO socket screws** simplify design problems—even in highly specialized equipment like this prototype precision loading device for use in advanced automated production operations.

# Miniaturize with UNBRAKO set screws

**HEAT-TREATED ALLOY STEEL***
**PLAIN CUP POINT**
**Class 3 Fit Standard**

| Diameter | | Threads per inch NC | Threads per inch NF | L Overall Length | Recommended Installation Torque in Inch-Pounds NC | Recommended Installation Torque in Inch-Pounds NF | Weight per Box of 100 in Pounds |
|---|---|---|---|---|---|---|---|
| #0 | D .060 F .028 | .. | 80 | 1/16 | .. | .5 | .01 |
| | | .. | 80 | 3/32 | .. | .5 | .01 |
| | | .. | 80 | 1/8 | .. | .5 | .01 |
| | | .. | 80 | 5/32 | .. | .5 | .01 |
| | | .. | 80 | 3/16 | .. | .5 | .01 |
| | | .. | 80 | 1/4 | .. | .5 | .01 |
| #1 | D .073 F .035 | .. | 72 | 1/16 | .. | 1.5 | .02 |
| | | .. | 72 | 3/32 | .. | 1.5 | .02 |
| | | .. | 72 | 1/8 | .. | 1.5 | .02 |
| | | .. | 72 | 5/32 | .. | 1.5 | .02 |
| | | .. | 72 | 3/16 | .. | 1.5 | .02 |
| | | .. | 72 | 1/4 | .. | 1.5 | .02 |
| #2 | D .086 F .035 | 56 | .. | 1/16 | 1.5 | .. | .03 |
| | | 56 | .. | 3/32 | 1.5 | .. | .03 |
| | | 56 | .. | 1/8 | 1.5 | .. | .03 |
| | | 56 | .. | 5/32 | 1.5 | .. | .03 |
| | | 56 | .. | 3/16 | 1.5 | .. | .03 |
| | | 56 | .. | 1/4 | 1.5 | .. | .03 |
| #3 | D .099 F .050 | 48 | .. | 3/32 | 5.0 | .. | .04 |
| | | 48 | .. | 1/8 | 5.0 | .. | .04 |
| | | 48 | .. | 5/32 | 5.0 | .. | .04 |
| | | 48 | .. | 3/16 | 5.0 | .. | .04 |
| | | 48 | .. | 1/4 | 5.0 | .. | .04 |

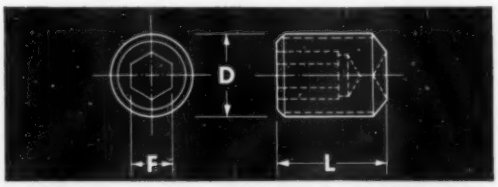
*Also available in stainless steel



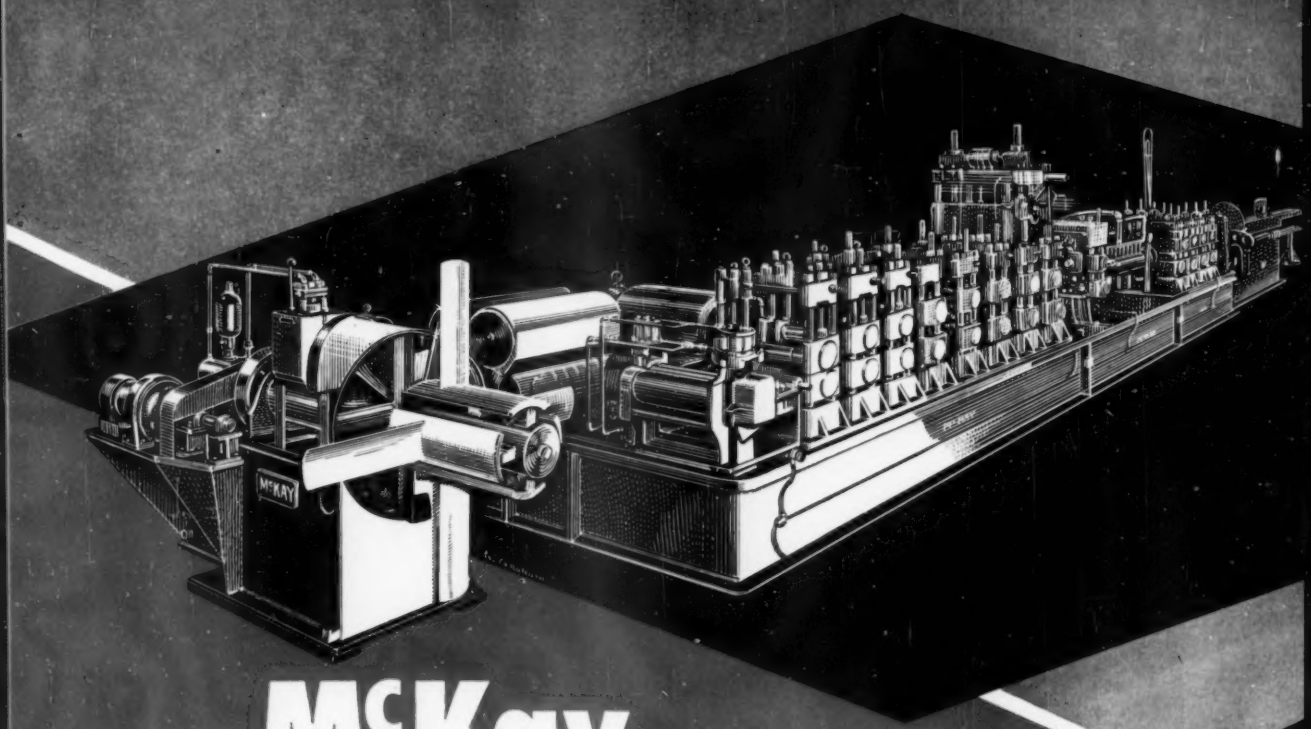
You need not design special set screws to secure your new miniaturized equipment. Microsize UNBRAKOS were developed specifically for use in modern small devices.

UNBRAKO screws are made of carefully selected alloy steel. They are manufactured to timepiece precision. Sockets are deep and uniform for greatest wrench engagement and longest reuse. Threads are fully formed for maximum strength and exact fit. And UNBRAKOS are heat treated to the optimum condition for high tensile strength and ductility without brittleness or decarburization.

Ask your authorized industrial distributor about microsize UNBRAKO socket screws today. Or write us for Bulletin 2055 and samples. Unbrako Socket Screw Division, STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

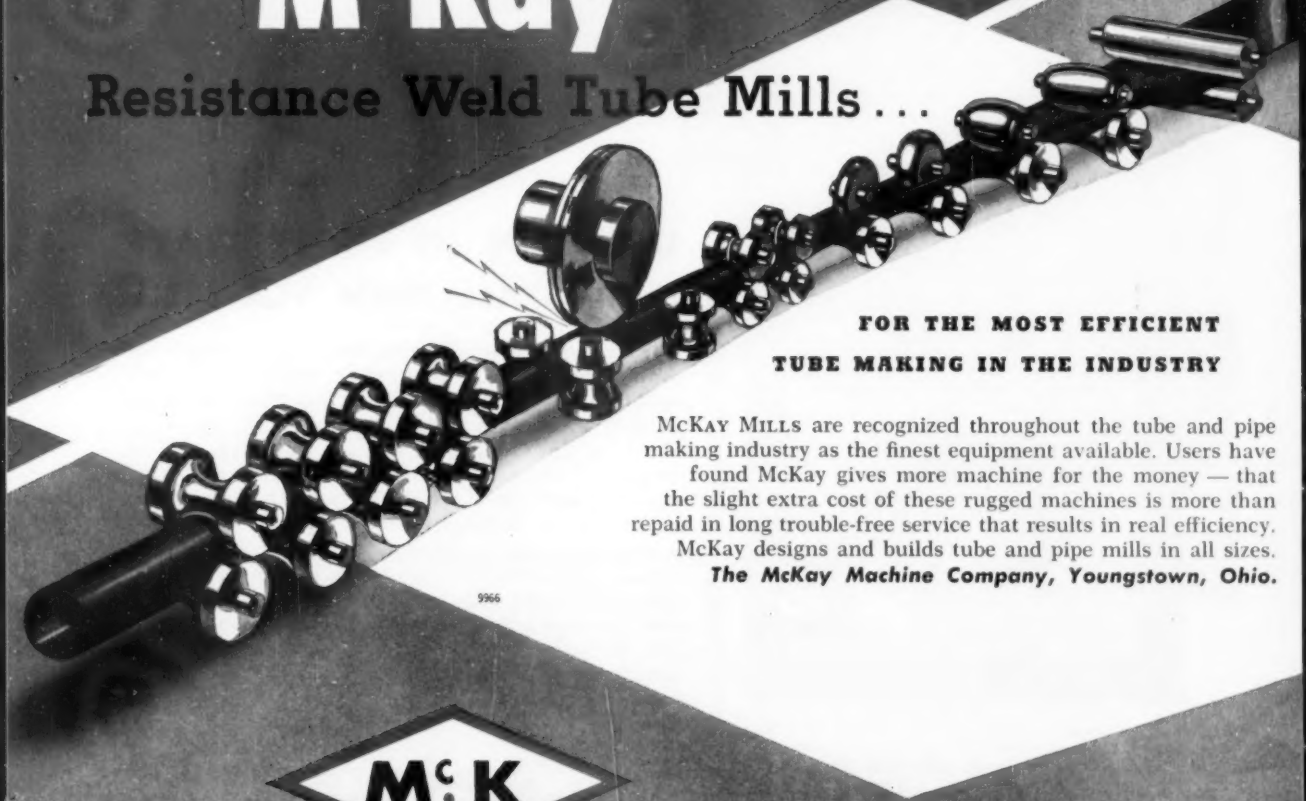



STANDARD PRESSED STEEL CO.
UNBRAKO® SOCKET SCREW DIVISION SPS
JENKINTOWN PENNSYLVANIA



# McKay

## Resistance Weld Tube Mills . . .



**FOR THE MOST EFFICIENT**

**TUBE MAKING IN THE INDUSTRY**

McKay Mills are recognized throughout the tube and pipe making industry as the finest equipment available. Users have found McKay gives more machine for the money — that the slight extra cost of these rugged machines is more than repaid in long trouble-free service that results in real efficiency. McKay designs and builds tube and pipe mills in all sizes.

***The McKay Machine Company, Youngstown, Ohio.***

9966

McK

*SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS*

# REHNBERG-JACOBSON

## RIM-BALL
# INDEX TABLES



WILL TAKE GREAT WEIGHT

•

EXTREMELY RIGID

•

COMPLETELY SELF-CONTAINED

•

RIM-BALL BEARING

•

EIGHT SIZES
54", 48", 42", 36", 30", 24", 20", 16"

•

3 TO 12 INDEX POSITIONS

(54"-48" minimum 5 Positions)

54"



16"

## USE THEM IN MANY WAYS . . . INSTALL THEM YOURSELF

It is hard to suggest *all* the possible ways you might use these index units. In addition to many conventional methods of horizontal mounting, they may also be set vertically to act as face plate or trunnion arrangements. Work-holding fixtures of almost any kind can be attached as desired. The RIM-BALL bearing enables the table to support great weight, yet turn easily, and it also eliminates any tendency for the table to tip or twist. A fixed center post, as shown above, can be furnished if wanted. Rehnberg-Jacobson Index Tables are shipped completely assembled and tested, ready for you to install by simply bolting down the base flange and mounting the drive motor. *Complete data sheets showing dimensions of all models are available, and will be sent promptly on request.*

*Designers and Builders of Special Machinery*

2135 KISHWAUKEE ST.

**REHNBERG-JACOBSON MANUFACTURING COMPANY**

ROCKFORD, ILLINOIS





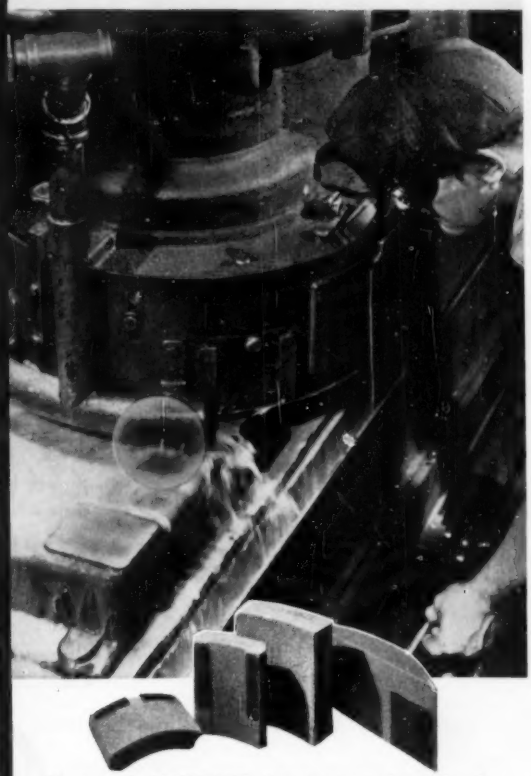
***The Famous Norton G Bond*** is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Wheels made with it bring you these "Touch of Gold" advantages: Cooler, faster cutting action . . . heavier cuts without burning . . . closer tolerances and smoother finishes . . . easier dressing and more pieces per dressing . . . more work, and more kinds of work, per wheel.

# Big surface grinders pay off big

## . . . with the G BOND-32 ALUNDUM* combination

*Your Big Surface Grinders* — like Blanchard, Hanchett, Mattison and Thompson machines—take deep cuts into grinding costs when you use Norton G Bond-32 ALUNDUM wheels or segments. See your Norton Distributor for details. Ask him about other popular Norton abrasives, including 19 ALUNDUM, 38 ALUNDUM and CRYSTOLON* abrasives. Or write to the nearest district office of NORTON COMPANY, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Behr-Manning Company, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

W-1717



***Norton 32 ALUNDUM Abrasive*** is another "Touch of Gold" advancement in grinding progress. It grinds exceptionally cool and fast, with minimum dressing, and is ideal for fast stock removal and heavy feeds. The G Bond-32 ALUNDUM abrasive combination is further proof that only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost.

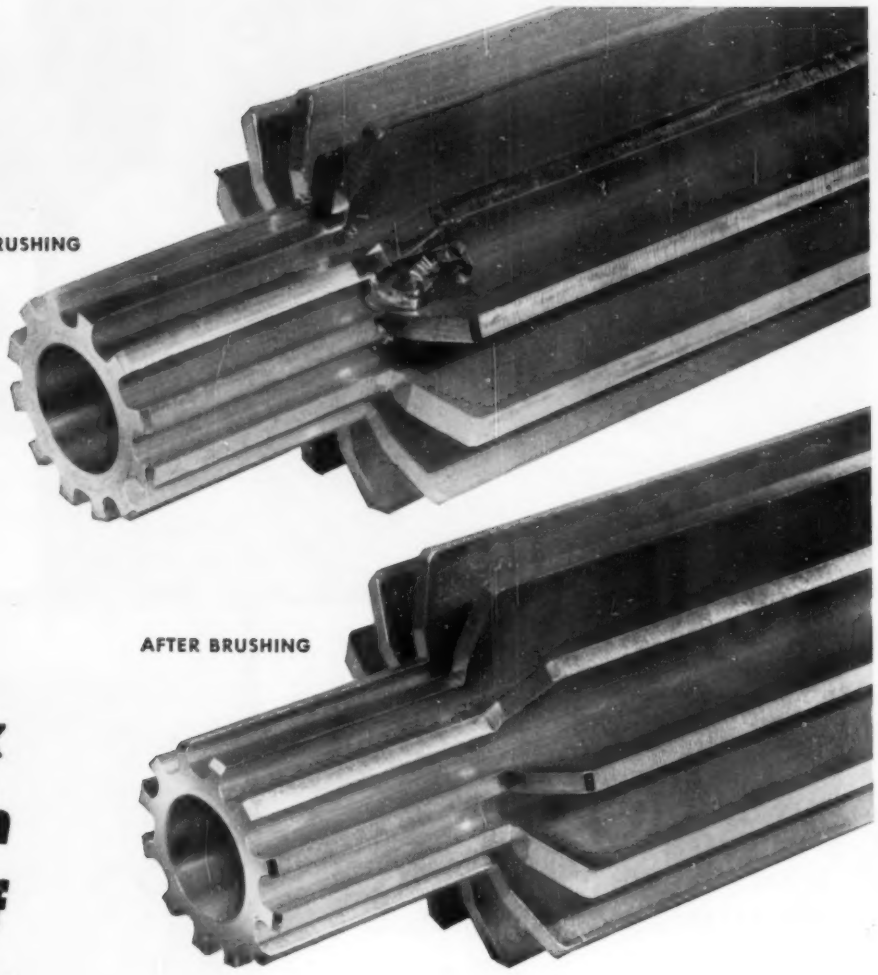
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*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries




# Quick brush off for burrs

MACHINING this extruded aluminum armature shaft for an aircraft generator turns up heavy burrs. However, Osborn's power brushing method quickly removes burrs and—at the same time—blends all sharp edges.

This is typical of how industry is using Osborn power brushing to improve and speed up thousands of finishing operations.

An **O**sborn **B**rushing **A**nalysis made in your plant will show how *you* can profit from Osborn power brush finishing. Write *The Osborn Manufacturing Company, Dept. K-25, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN

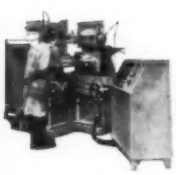
BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES



# Helps put the "B-G" in the BiG New 1956 LINCOLN

## . . . the PRATT & WHITNEY KELLER Type BG-22

Hallmark of Lincoln styling is a distinguished, lithe, trim look with gracefully flowing lines. Producing the huge dies that faithfully translate the designer's drawing board dream into a reality of smoothly formed metal is just one of the jobs done so well by Pratt & Whitney Keller Automatic Tracer-Controlled Milling Machines. Shown here is a big Keller Type BG-22. Following a plaster model, it sculptures the complex contours of a rear quarter panel in solid metal . . . quickly, exactly and, above all, economically.

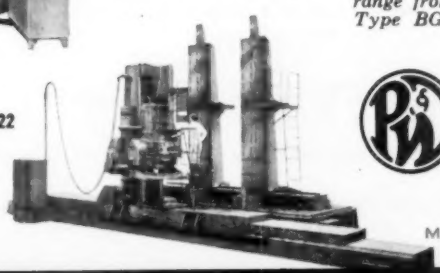


**SMALL . . . or LARGE**

*There's the right size Keller Machine for every plant, for every job. Capacities range from 36" x 20" (for the compact Type BL) to 20' x 7' (for the giant Type BG-22). Write for complete information outlining your requirements.*

TYPE BL

TYPE BG-22



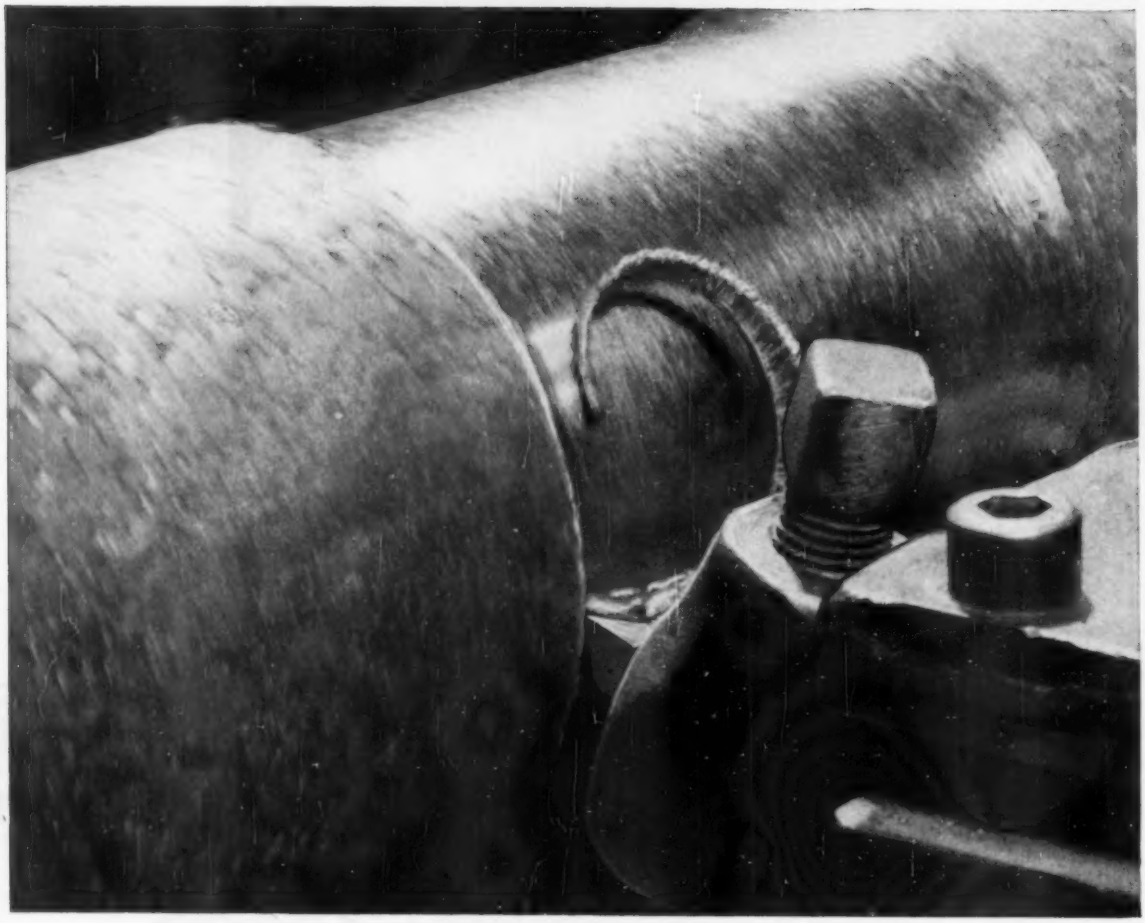
**PRATT & WHITNEY COMPANY**

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*Direct Factory Representatives in Principal Cities*

MACHINE TOOLS • GAGES • CUTTING TOOLS



# One Pound of Metal Removed Per Minute

Two HAYNES STELLITE alloy tools remove 118 cubic inches of metal from rough, uneven nickel-chromium billets in 20 minutes. They trim ½ in. from the diameter in one pass, and finish two of the 170-lb. billets per grind. Each tool removes about a pound of metal per minute in spite of the irregularity of the billet. Cutting speed is 37 surface ft. per minute and the rate of feed is ⅝ in. per minute. Heat generated during the cutting operation quickly dulled the cutting edges of high-speed steel tools tried on this job, and the rough cut caused other tool materials to chip. Only HAYNES STELLITE 98M2 cobalt-base alloy tools proved to be both hard and tough enough to do the job efficiently.

HAYNES STELLITE alloy tools are successful on applications like this one because they have good impact strength, high compressive strength, and their cutting edges remain hard and sharp even when red hot. They remove metal fast. They can be used at high speeds with comparatively high feed rates, and they take deep cuts.

More information on HAYNES STELLITE tools and how they can be used to best advantage is contained in the booklet, "HAYNES STELLITE Metal-Cutting Tools." Write any of the district offices listed below for your copy.

HAYNES TRADE-MARK ALLOYS

**HAYNES STELLITE COMPANY**

**A Division of Union Carbide and Carbon Corporation**

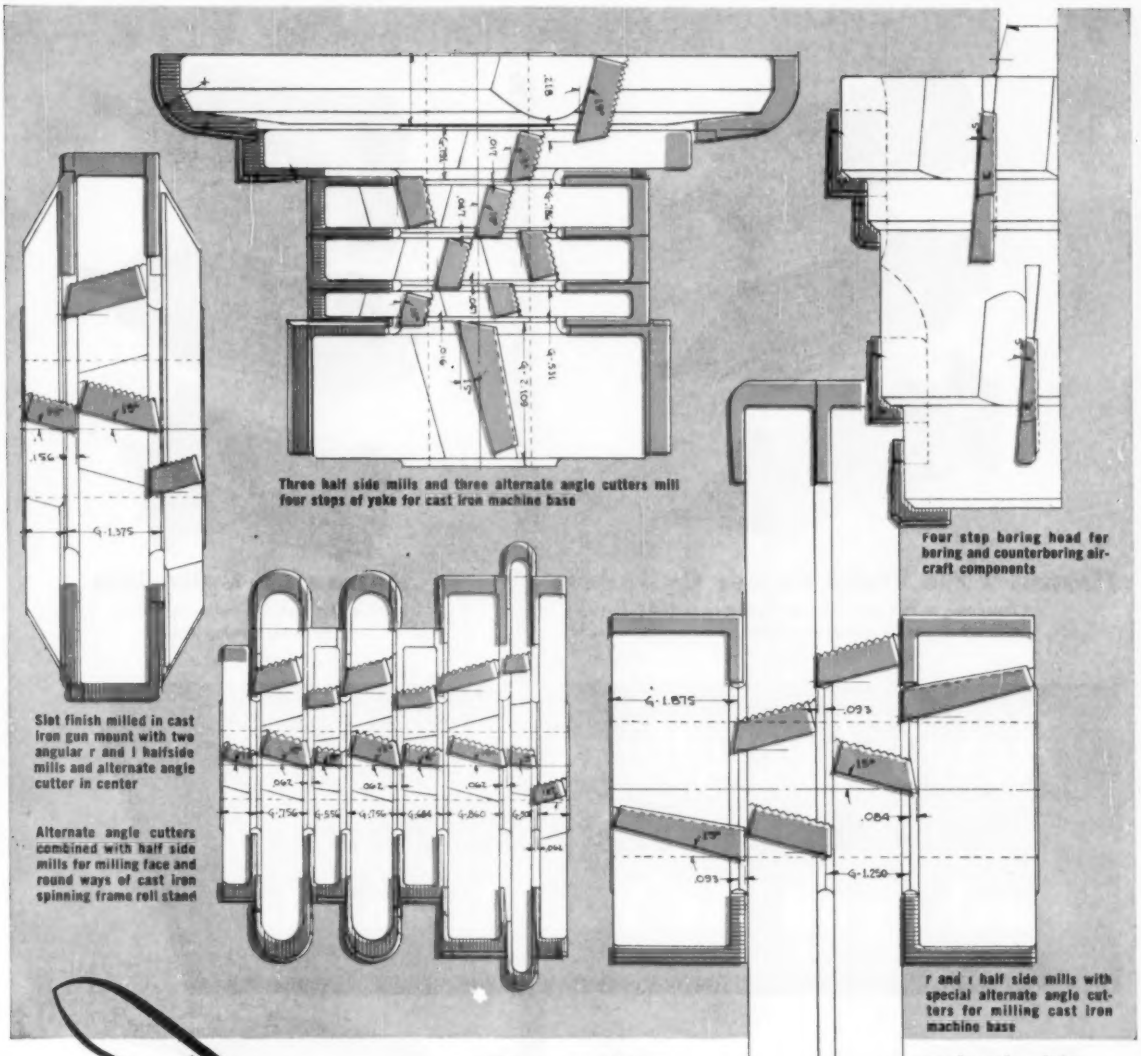
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Three half side mills and three alternate angle cutters mill four steps of yoke for cast iron machine base

Four step boring head for boring and counterboring aircraft components

Slot finish milled in cast iron gun mount with two angular r and l halfside mills and alternate angle cutter in center

Alternate angle cutters combined with half side mills for milling face and round ways of cast iron spinning frame roll stand

r and l half side mills with special alternate angle cutters for milling cast iron machine base

# *Free* - 50p Book

**engineering data**
**tooling specifications**
**and helpful information**

This book of fifty O K Tool prints shows how leading manufacturers in aircraft, automotive, electrical and machinery industries meet rising production costs with *new multidiam boring heads* and *milling cutters* — new tools that do up to eight and ten metal-removing operations with a single stroke of the machine or one pass of the tool.

Special heads bore and face at four levels, chamfer some holes, all in a few minutes. Savings in man hours and machine time can be reduced to one-sixth of the previous cost.

Fresh from the press and now released for the first time, this book is an inspiration to engineers, designers, methods and production men. IT'S FREE!

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**modern milling cutters for modern milling machines**

**The O K Tool Company, Inc., 300 Elm Street, Milford, N. H.**

**THE OK TOOL COMPANY, INC.**
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Please send me a copy of OK's new multidiam tool book

name _____

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employees _____

Equipment: how many boring mills _____

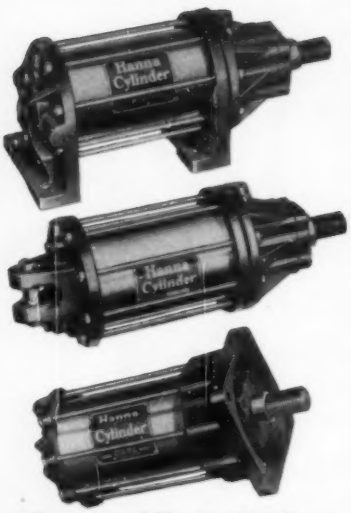
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**Hanna T750 Fluid Power Cylinders**

Air Operation to 250 psi, Hydraulic Operation to 750 psi
Write for Catalog 750A




**Hanna LP Cylinders**

Air or Hydraulic Operation to 110 psi
Write for Catalog 236B

# Here's Everything You Need

## Smooth, Dependable Power Packaged As You Want It

■ "Good things come in small packages," it is said . . . so do Hanna Cylinders . . . and in medium and large packages, too. From the complete Hanna Cylinder line, up to 1,500 psi capacities, you can select a standard size and mounting style, with the power and stroke you need, to exactly suit your applications. Of course, you will be sure it's the finest cylinder for the job—because it's a Hanna. Well over fifty years of design and manufacturing experience guarantee that.

So, when you need reliable cylinders for products you make for resale, or for use in your own plant, consult a Hanna representative, or call on our plant engineers to help you find the most efficient answer to your problem. Also write us for technical literature.




**Hanna HP Cylinders**

Hydraulic Operation to 1,500 psi
Write for Catalog 233B

**Hanna Engineering Works**
1768 Elston Avenue, Chicago 22, Illinois



**...for piloted taps from stock**

SEE YOUR

Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES



Made by THREADWELL, Greenfield, Mass.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corp. Export Distributor: Bethlehem Steel Export Corp.



# Want Fast Tool Steel Service?

## SEE YOUR BETHLEHEM DISTRIBUTOR

Whether you want to order a quantity of tool steel, or merely a short bar, or just would like a bit of advice about the correct method of heat-treatment, you're sure to find your Bethlehem tool steel distributor anxious to be of service.

Prompt service is your distributor's middle name. He makes it a point to know your city like a book—its background, its people, its industry. He knows what grades of steel you are most likely to need, and in what quantities. And so he keeps large stocks of Bethlehem tool steel on hand, in a virtually endless variety of types, all of them ready to go at a moment's notice.

If you would like bars cut to special length, or if there's a tricky phase of metallurgy or some other tool-steel problem troubling you—again, your distributor is at your beck and call. He's a real friend. They don't come any better. It will pay you to get to know him.

BETHLEHEM STEEL

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# The Tool Engineer


## Always a Student

It is too bad that some folks graduate! Too many people mistake graduation for the end of the journey instead of just the significant milestone it is. No doubt, recent graduates among our membership realize the truth of this but some of us have forgotten. We should be students "all ways."

Being a student is a state of mind, not a specific period in life. Students are aware of the dynamic forces at work and join in the fun of learning more about them. Just as "there are no strangers—only friends waiting to be met," so there are no mysteries of nature—only natural laws waiting to be discovered. Students discover them.

Consider the new products that have been made available within the last few years—television sets, jet-powered planes and air conditioners, to name a few. They would have been impossible were it not for the students of tool engineering who keep abreast of new developments in manufacturing and help accelerate their progress.

Active membership in American Society of Tool Engineers is one potent way to be "all ways" a student. Participate in your chapter's activities, use the ASTE technical handbooks, read THE TOOL ENGINEER, and attend the technical sessions and exhibitions at ASTE Annual Meetings. Education is one of the big themes in ASTE! Many of the finest engineering schools hold annual Tool Engineering Conferences in cooperation with local chapters and the National Education Committee.

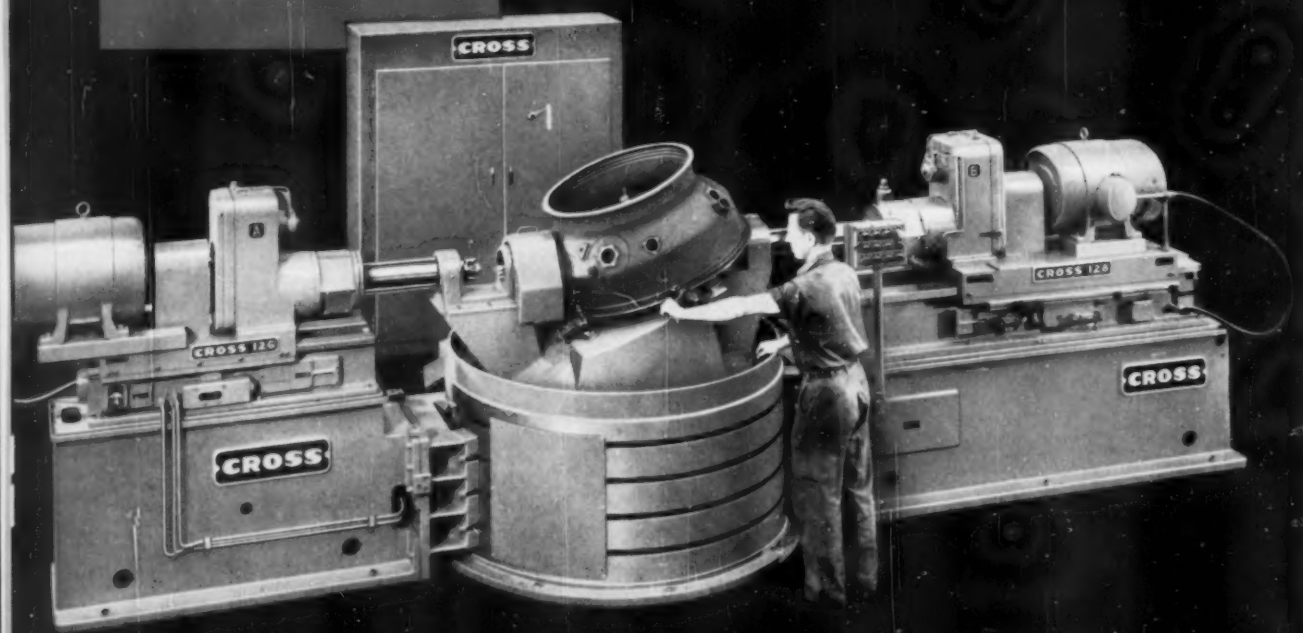
Here's to our "all ways" students of all ages. May their numbers increase!

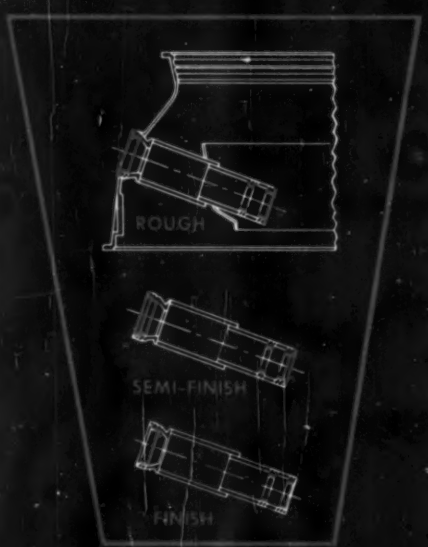
H. C. McMillen

President

# Precision Bores and Faces Diffuser Cases

*Another Special by Cross*




This Two-Way Boring Machine roughs, semi-finishes and finishes the accessory drive shaft hole of Jet Engine Diffuser Cases at the rate of 2½ pieces per hour. The operator places the part in the work holding fixture and the rough boring cutters in the boring spindles, after which the rough boring is performed automatically. Next, the operator replaces the rough boring cutters with semi-finish boring cutters and the cycle is repeated for the semi-finish boring operation. Then, the finish boring operation is performed in a similar manner and the part is removed.

The cutters are supported in live precision bearing spindles, which are in turn supported by hardened and ground steel bushings adjacent to the work.

All cutters are pre-set for size and are quickly and easily changed for the different operations.

To provide maximum flexibility for future part design changes, the machine is built with Cross Modular "Building Block" Units.

*Established 1898*

THE CROSS CO.

*First in Automation*

DETROIT 7, MICHIGAN

# how to set up a throw-away tool program

**By David C. Kauffman***
**Methods Development Engineer**
**Manufacturing Engineering Dept.**
**Wright Aeronautical Div.**
**Curtiss-Wright Corp.**
**Wood-Ridge, N.J.**

**Because throw-away inserts and the tooling associated with them are available in various styles and sizes, they should be thoroughly studied before making a decision to convert to their use. This article outlines the characteristics to look for in throw-away insert tooling and suggests an orderly program for its introduction into manufacturing.**

CONVERTING TO THROW-AWAY TOOLING from single-point tools and solid carbide insert slugs requires effort and planned tool engineering but results in cost reductions well worth the effort. Throw-away tools have been in use, *Fig.* 1, long enough to establish their position in manufacturing and it is now only necessary to broaden the program for their application. Reduced tool costs, improved machine productivity, reduced grinding requirements, lowered time standards, improved quality, reduced scrap and less lost time for tool changes are some of the benefits resulting from use of throw-away tools.

There is nothing new in the mechanical clamping of tips in holders. Tools of this type have been used since the 1800's. Current interest in such tools is the result of several factors. With the increased application of carbides, assignable diamond wheel costs increased and cutter grinding departments became overburdened. Improper grinding resulted because of overwork, inadequate or insufficient equipment and unskilled operators. In many instances, it was found that regrinding costs for simple single-point tools, especially when they had been abused, were more than the cost of a new tool. Improper grinding led to cracked and broken tools, further increasing tooling costs.

Brazed tools have a tendency toward brittleness, and toughness is more important than hardness for a brazed tip. To fully realize the advantages of carbides, mechanically held tips of the harder grades were tried. Mechanically held slugs circumvent inherent brazing limitations but, because the slugs require regrinding, do not alleviate grinding department problems. The throw-away insert evolved because it is more economical to index, invert and discard a minimum length slug than to regrind longer slugs.

Mechanically held inserts have introduced another grinding department saving. Grinding chip breakers into single-point tools or solid carbide slugs requires prodigious quantities of diamond wheels and involves extravagant use of tool material. All existing throw-away insert toolholders have built-in chip breakers that are usually part of the clamping device and add little to the cost of the holder.

Huge numbers of single-point tools are required for the manufacture of aircraft engines, for example, but they are purchased in relatively small quantities. Thousands of purchase orders may be needed to maintain stocks of tools over a relatively short period of time. Handling of orders and tools by several departments adds to already high tooling costs. Throw-away inserts can minimize inventory and purchasing problems.

Single-point tools lead to additional difficulties because operators are reluctant to change tools when necessary. All too often, a few more parts are pro-

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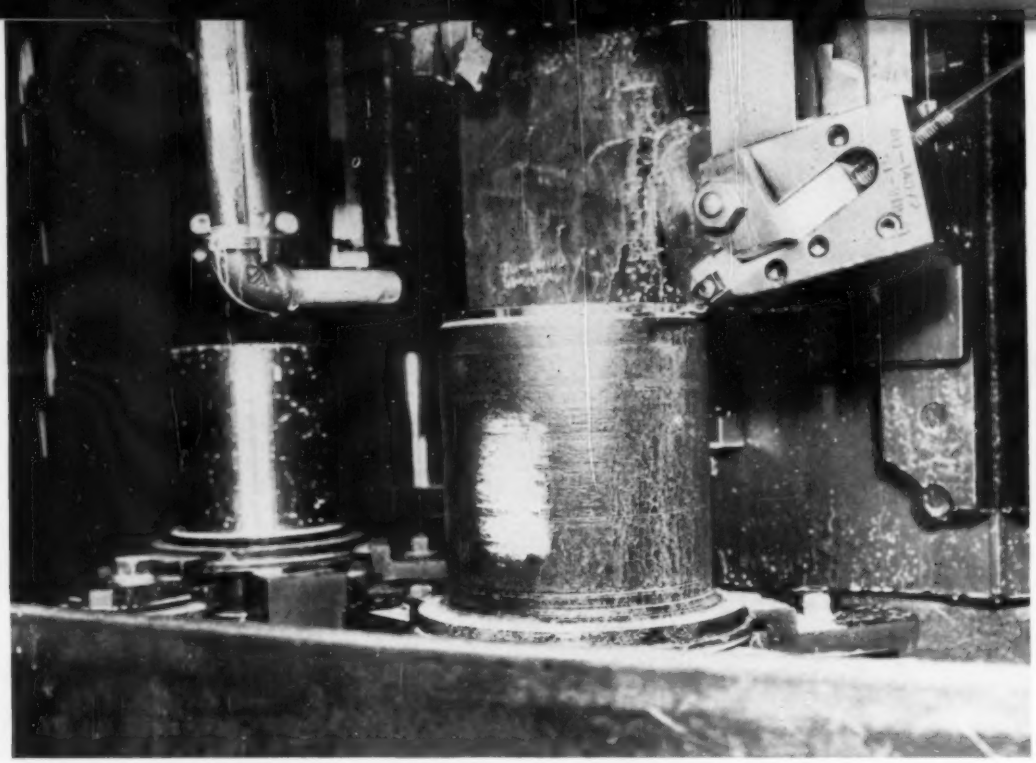


**Fig. 1. (above) Throw-away tooling has resulted in major cost reductions as in this rough turning operation on an aircraft engine cylinder barrel.**



**Fig. 2. (right) Throw-away inserts showing the variety of radii and several thicknesses in which they are available. The white inserts are ceramic.**

duced with tools that should be returned for grinding. Such worn tools may break, cause smashups, produce scrap and, because insufficient material is removed from the workpiece, result in failure of following operations. Even if none of these failures were to occur, regrinding costs would be excessive. Operator reluctance to change tools when necessary can be almost completely overcome by throw-away inserts because it is so easy to index an insert to a new cutting edge.

**Throw-Away Inserts:** As the name implies, throw-away inserts can be discarded when all cutting edges have been used. Inserts are available finished ground all over (Precision Ground) or with just the tops and bottoms ground (Utility). Tolerances of utility inserts are rather large and they cannot be used for precision indexing when workpiece tolerances are close. Performance of inserts is comparable to or better than that of single-point tools.

Unfortunately, carbide producers have not yet standardized sizes and shapes of throw-away inserts. Inserts are currently available in large and small triangles and squares, *Fig.* 2. These four types of inserts are usually available in two thicknesses with various corner radii. Few producers make the same styles, sizes or radii. Thickness of the insert necessary is determined by the holder in which it will be used. Some holders have interchangeable anvils so that either thickness of insert can be used. Usually, thin inserts have small radii and thick inserts have larger radii. Circular disks are being manufactured by some producers and some companies also make a ¼-inch I.C. triangle.

Current interest in ceramic cutting tools can be combined with investigations into conversion to throw-away insert tooling. There is a strong possibility that ceramics will introduce improvements in machining techniques and use of ceramic inserts would offer a good method of application.

**Toolholders:** Throw-away insert holders, *Fig.* 3, have been given the same style numbers and size designations as former mechanical clamping holders so that it is sometimes difficult to distinguish between old and new holders. Not all companies make the same sizes or styles and what is standard for one producer may be special for another. Costs may

be five times higher for nonstandard toolholders.

Approximately ten companies now produce throw-away insert holders. Each holder style has advantages and disadvantages. It is important to determine requirements of the proposed application before selecting a particular holder. Necessity for positive rake should be carefully considered. Toolholders are available with either negative or positive rake. However, positive rake holders cannot accommodate invertible inserts so half the insert life is lost.

Most toolholders have hardened (35 to 50 $R_C$) shanks. A hardened shank is necessary to insure long life, resist burring and maintain insert pocket dimensions. Overhang is necessary because of clamps and chip breakers but it should be minimized.

CHIP BREAKERS: When chip breakers are required, their use is usually critical. For this reason, when a chip breaker is needed, the holder should be designed so the breaker can be accurately relocated when replaced. Accurate location is a problem when replacing a breaker or when loosening the clamp to index an insert on some holders.

Positioning of the chip breaker is simple if its design includes some means of adjustment. Also, the toolholder will have wider application if the breaker can be adjusted to give tighter or looser chips. Special chip breakers are expensive and should be avoided. Some chip breakers are made of cast alloys and these should be compared to carbide before a decision is made on proper material to be used for the chip breaker in a particular application.

ANVILS: Some throw-away insert toolholders are adapted to the two insert thicknesses by using different thickness anvils. Most holders now use carbide anvils. Because the anvil can be damaged by breaking of an insert, anvils are usually replaceable. Some anvils can be indexed, further reducing tooling costs.

Inserts should overhang anvils as little as possible to protect the bottom edge of the insert from chips and consequent chipping. Because there is some chip welding on the insert cutting edge, some means should be provided on the anvil to insure proper seating when the insert is inverted. Various anvils have bevels, ledges or grooves to provide space for the built-up edge. However, built-up edge should be removed before inverting inserts.

CLAMPS: Basically, clamps retain throw-away inserts in proper position in the holder. Some clamps are faced with carbide so they can also serve as the chip breaker. Various holders have clamps that lock inserts up or down. Serrated clamps resist chip pressure and maintain insert and chip breaker positions. Serrations on the clamp also help to properly relocate the chip breaker when the insert is indexed.

**Establishing a Program:** When the variations in available tools are known and the decision to convert to throw-away insert tooling has been made, conversion should be undertaken systematically. A conversion team should be activated to study production needs, implement conversion plans and train personnel who will be affected by the conversion.

A logical first step is to survey individual production departments to determine the practical applications for throw-away insert tools. Each machine should be examined along with its tool layout. Tools that can be converted can be noted on the layout. If such conversion would necessitate changes in other tools or tool blocks, this information should be noted on the layout. By concentrating conversion effort in a single department, conversion is simplified and conversion team time is most efficiently expended.

To save time and minimize confusion, it is a good idea to concentrate initial efforts on a single type of toolholder embodying the most desirable features, and available in a wide variety of sizes and shapes. Refinements, through the use of additional styles of holders, can more easily be introduced after the basic conversion program has been completed in a test area. By concentrating on a single style of toolholder, inventory problems can be minimized, *Fig.* 4. Also to reduce confusion, three tabulation sheets can be prepared before any conversion is attempted. One sheet would list all styles and sizes of a single type toolholder. A tool number would be assigned to each. Another sheet would list the sizes, shapes, carbide grades and tool numbers assigned to inserts. Only one thickness of inserts should be used, thick or thin. The third sheet would have all the data on chip breakers and their tool numbers.

By numbering the tools before they are required, the total quantity of tool numbers can be drastically reduced. All members of the conversion team and all using activities in the plant would thus be assigning the same numbers by referring to tabulated drawings. Otherwise, the same tool might be given dozens of different numbers. Ordering would then be in multitudes of small quantities rather than in economical large lots.

During the early stages of conversion, only those applications that are heavy users of tools or that present continuing problems should be converted. In this way, cost reductions and minimized problems show up immediately so cooperation during the rest of conversion is assured.

It is also possible to set up a program for conversion by type of machine. With this approach,

valuable experience can be gained rapidly by concentrating attention on a single type of operation. Suggestions for conversion can then be based on sufficient performance data to assure success of the change. The cutter grinding department offers another opportunity to gather data on conversion possibilities. Tools that appear in large quantities and that are expensive to regrind should be given priority during initial stages of conversion.

During the initial stages of conversion, decisions to convert specific tools should result from a group effort. The group should comprise representatives of the conversion team, vendors, tool troublemen and the time standards group. Before this group assembles, the conversion team should gather all pertinent facts on the tools that logically could be considered for conversion.

Factors that should be taken into account are tool design, adaptability of a standard toolholder, amount of subsequent work done on the piece part, expected performance, modifications required, former tool life, and anticipated sizes and styles of holders and inserts.

Final decisions on specific tools should be based on cost histories of current tooling and estimated expenses of throw-away insert tooling, *Fig.* 5. Information needed on current tooling includes initial cost of tool, number of pieces per regrind, tools required per month, cost of regrinding and tool changing time. For estimating purposes, it can be assumed that the inserts will produce the same number of pieces per cutting corner as does the single-point tool per grind. Experience seems to indicate, however, that inserts can produce more pieces per edge.

Current inventory of single-point tools frequently dictates when a conversion should be made. If inventory is high, a "stop" order can be issued

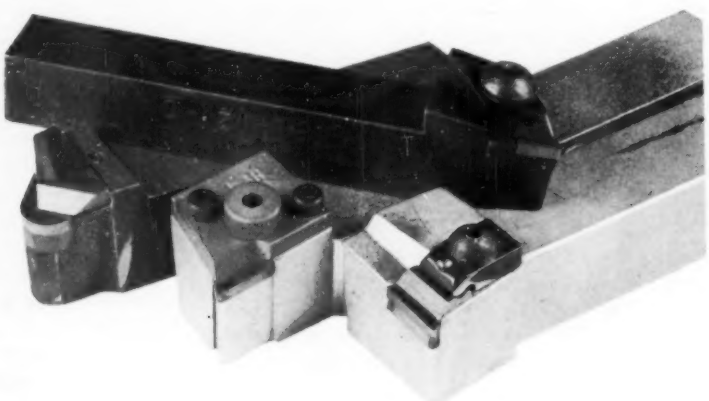


**Fig. 3. (right) Various types of throw-away insert toolholders have individual designs for clamping devices, chip breakers and shims.**

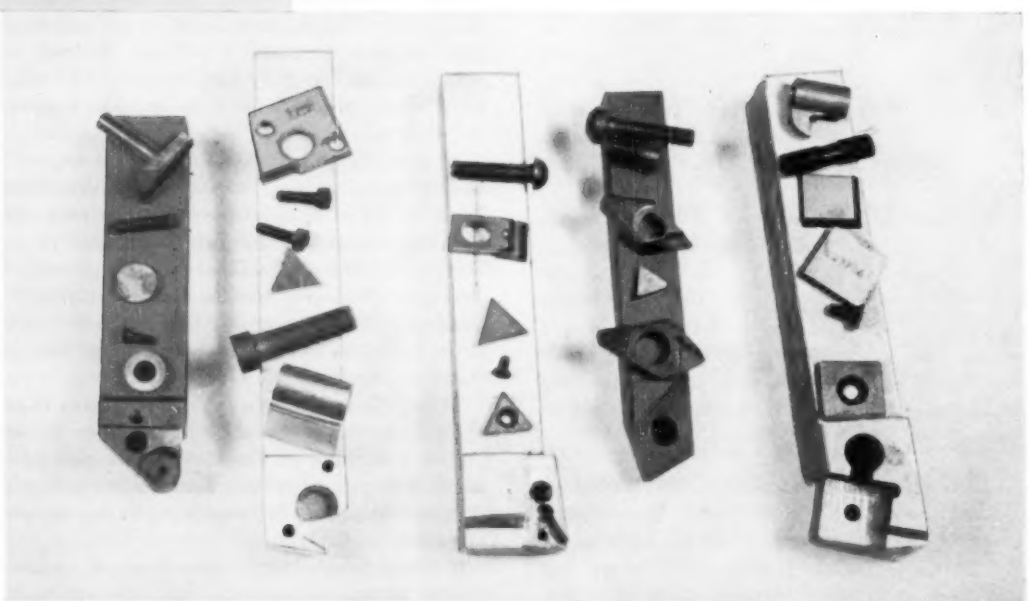


**Fig. 4. (below) By concentrating on a single type of toolholder, problems of stocking various perishable spare parts can be minimized. Pictured are several holders and the spare parts associated with each.**

COST ANALYSES

Throwaway Tool Program

Department _____ Part Name and No. _____

Oper. No. _____ Other Parts _____

Date _____ No. of Tools _____

Old Tool No. _____
Pieces per grind _____
Grinds per tool _____
Grind time per tool _____
Tools used per mo. _____
Grind time per mo. _____
Cost of grind time per mo. _____
Cost of tool _____
Tool cost per mo. _____
Tool and grind cost per mo. _____
Tool and grind cost per yr. _____
Savings per year after the first year _____

Tools in Master tool crib:
Quantity _____ Value _____
Tools in System:
Quantity _____ Value _____
Total value of tools in system _____
Salvage value of obsoleted tools _____

Cost of new holders _____
Cost of Insert _____
Holders req. per yr. _____
Inserts req. per year _____
Total cost of new tools per year _____

Tool cost reduction - 1st year _____

**Fig. 5. Form used so that proposed conversions can be analyzed on the basis of costs.**

against the tool so it will not be reordered. When inventory is reduced to a certain level, conversion of the tool can proceed. Value of the tools in stock should not hinder conversion in all instances. It should be considered that, in many instances, savings through conversion would more than offset an inventory loss.

Following a favorable decision to convert a particular tool, it is advisable to run a demonstration using the insert and toolholder on a typical machine, *Fig.* 6. Such demonstrations give an opportunity to prove the adaptability of the tooling, to develop new time standards and to select the optimum grade of carbide. During such operations, all bugs can be worked out with minimum disruption of production. Machine operators, tool setters and setup men can be trained for the new methods in small groups rather than on a large scale. Accurate records should be kept of the number of pieces per cutting corner, amount of breakage, feeds and speeds used, and other performance data.

Upon successful completion of a demonstration, permanent tooling can be ordered. Also paper work can be done. New tool numbers should be put on process sheets and tool layouts should be corrected. At the same time, superseded tools should be removed from stock and sent to salvage. Close liaison should be maintained with the tool stores activity so that new tooling will be available when necessary and so that stocks of former tools will be gradually reduced.

One major problem that may be encountered during conversion to throw-away insert tooling is that of keeping track of the conversions and the tools required. Confusion and uncertainty can be avoided by recording, on one sheet of paper, all the holders and inserts used by one machine. If more than one machine is doing the same operation, all machines can be listed on the one sheet. The total quantities of holders and inserts indicated on the separate sheets can be transferred to a master list. The master list shows current "min" and "max" limits, numbers of tools in stock, tools on order, delivery dates, etc. Increased requirements are indicated by the master list and orders can be increased accordingly.

Since it is desirable to maintain production once the conversion has been made, a suitable supply of holders and spare parts should be accumulated as soon as possible at the start of the program. Inventories should be taken periodically to insure an adequate supply of tools as the use of throw-away

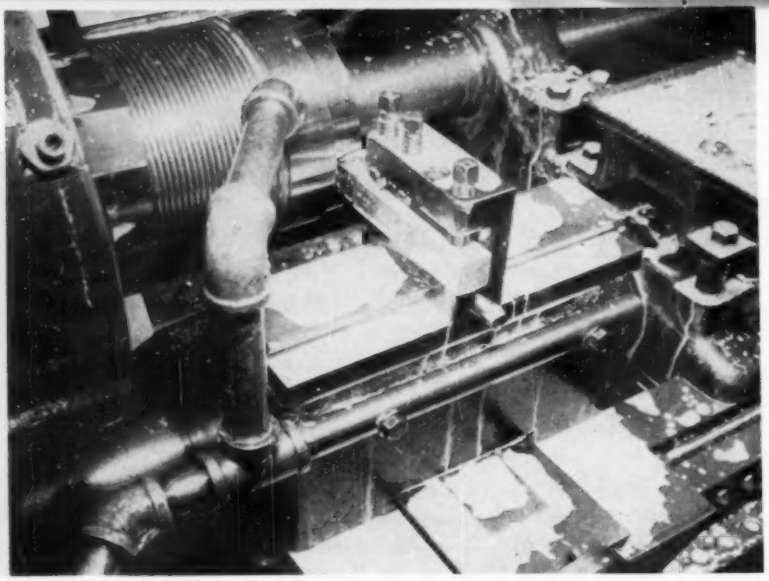


**Fig. 6. Demonstration of the feasibility of turning outside diameters of cylinder barrel with throw-away insert tooling. Tool life was doubled and scrap reduced.**

insert tooling increases. As a conversion program gets well under way, tools for demonstration purposes are withdrawn from supplies ordered for production runs. If a master inventory sheet is maintained, such withdrawals are noted and shortages are forestalled. As each type of machine or process is converted, tool stock maximums and minimums should be increased to insure proper ordering. More problems would be met with toolholders than with inserts because the latter can be secured rapidly and ordered in large quantities without fear of overstocking.

When ordering tools for demonstration purposes during the initial stages of a conversion program, it may seem that too many holders are required. Experience has shown that if the demonstration proves successful there may be delays in obtaining production toolholders. It has been suggested that sufficient tools should be ordered at the time of demonstration so production can be maintained if the demonstration proves successful.

**After Conversion:** By concentrating on one style of holder and using pretabulated tool numbers, Curtiss-Wright was able to convert quickly and save large sums of money. With just one type of toolholder, there are but three or four spare parts needed. About 95 percent of the throw-away applications are handled with just seven inserts. In all, six types of holders in five sizes are used.

Conversion manpower was more effective because efforts were limited to one holder style at the beginning. Now that the basic conversion program is completed, with inherent savings already in evidence, time is being taken to evaluate other toolholder styles and various new grades of carbides.

All tool requirements for new processes are now screened with a view toward setting them up with throw-away insert tooling. In addition, all purchase orders for single-point tools are reviewed so that those for large quantities can be questioned. This leads to further conversion to the new tools..

Tool troublemen have realized the merits of throw-away insert tooling, and are quick to attempt conversion on applications where trouble recurrs. Forms have been prepared for the troubleshooters so that conversion can be simplified. These forms institute steps for preparing records, making cost analysis, ordering tools and changing process sheets.

A major saving results from conversion because inserts can be purchased in large quantities for use anywhere in a plant. Bulk handling, purchasing and storing result in further savings. Precision-ground inserts are used for all applications at Curtiss-Wright. Longer lives, lower breakage and accurate indexing warrant their use.

Throw-away inserts are economical in their own right, but further economies result if they are not discarded. Used inserts are worn on the corners but the straight sides make excellent chamfering or facing tools, *Fig.* 7. Where depth of cut is not large, it is only the corner of the insert that has any appreciable wear land. Such inserts can be returned to the vendor and reground on the radii to the next larger size at a cost equivalent to 1/3 of that for a new insert. The reground insert has all the merits and use of a new insert. Its number is changed to reflect its new size. Other worn inserts can be used to retip single-point tools for special shapes.

It is advisable to recheck a converted operation at the end of three months. At that time, operations should be running smoothly and production data would give an accurate picture on which to base future conversion decisions. Results that can be expected are typified in the table.

It should be brought out that not everything is as smooth and simple as it may appear. Problems are encountered during conversion to throw-away insert tooling. Problems are generated not so much through shortcomings of the inserts or holders but through errors in application and operation. If,

**Comparative Tools Costs for Rough Turning Cylinder Barrel Outside Diameters**

| Factor | Single-Point Tooling | Throw-Away Tooling |
|---|---|---|
| Tool or insert cost (dollars) ..... | 4.00 | 0.77 |
| Tool regrinds (No.) ..... | 6 | — |
| Barrels per grind or per corner (No.).. | 8 | 20 |
| Cost of regrinding (dollar) ..... | 0.75 | — |
| Prorated toolholder cost (dollar) ..... | — | 0.23 |
| Production per tool or per insert (No. of barrels) ..... | 56 | 120 |
| Machining cost per barrel (dollar) ... | 0.152 | 0.0084 |

for example, insufficient consideration is given to chip control—or if speeds and feeds are changed in the shop—chips may jam the ways or chucks of machines. This could result in damage to both the machine and the tooling.

Tool breakage is a constantly recurring and troublesome problem in any plant. Most breakage is caused by not changing tools often enough. When an insert holder is smashed, it represents an expense about three times that of a single-point tool. Part of any throw-away insert tooling program should be indoctrination of operating personnel. When an insert corner breaks, it usually washes out the anvil. In one operation, such a washout occurred. The anvil was indexed and a new insert was used. However, the damage to the anvil had raised a burr and the insert could not lie flat. For a while, periodic insert breakage on this holder was experienced but not explained.

Sides of tip pockets in toolholders gradually wash out, brinnel or bend so the proper angles are no longer maintained. It becomes increasingly difficult to locate and hold the insert. When subjected to cutting pressure, the insert can move and break. Top clamps wear and bend so they no longer properly locate and hold the insert. Socket head screws can wear and, if they are not replaced, may result in loose parts and subsequent breakage. Through education of the operator, especially toward changing the cutting edge at correct intervals, such problems can be minimized.

It is feasible to repair large and expensive toolholders. Hard metal can be brazed to washed out portions of the holder. Regrinding, milling or otherwise reshaping the insert seat can then save considerable expense. Anvils should be inspected often, and indexed or changed when required. The carbide grade used for most anvils is comparatively soft and a burr can be formed on impact.

Experience indicates that throw-away insert tooling is here to stay. Many advantages are apparent for such tooling and they heavily outweigh the disadvantages. Cutter grinding work is reduced, large quantities of many styles of single-point tools and solid carbide slugs are unnecessary and diamond wheel consumption is reduced. Design time is considerably reduced through the use of a minimum, but adequate, number of toolholders and inserts.

Carbide consumption is considerably less, especially if other uses are found for used inserts. Production time can be reduced because tool changes are not as frequent and do not take as long as when single-point tools are used. Bulk handling of tools introduces savings from purchasing through use. In many respects, introduction of throw-away insert tooling can prove as beneficial as has the initial introduction of tungsten carbide.

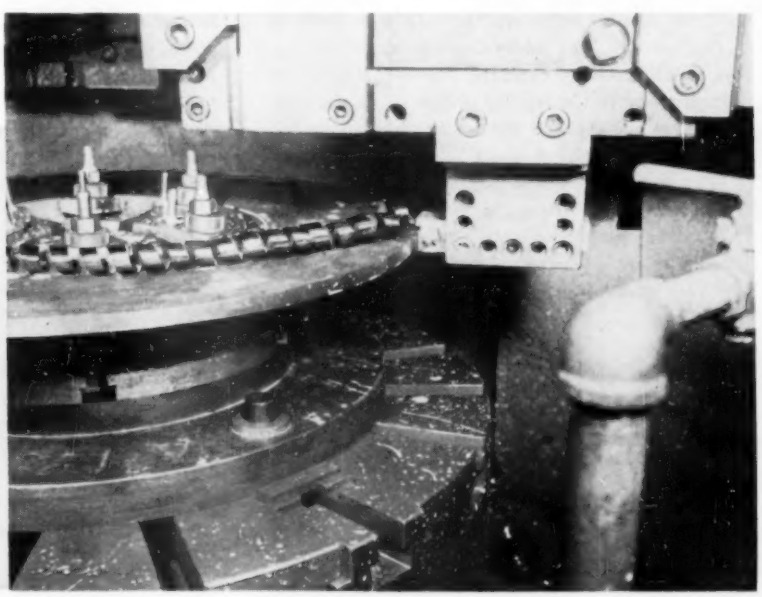
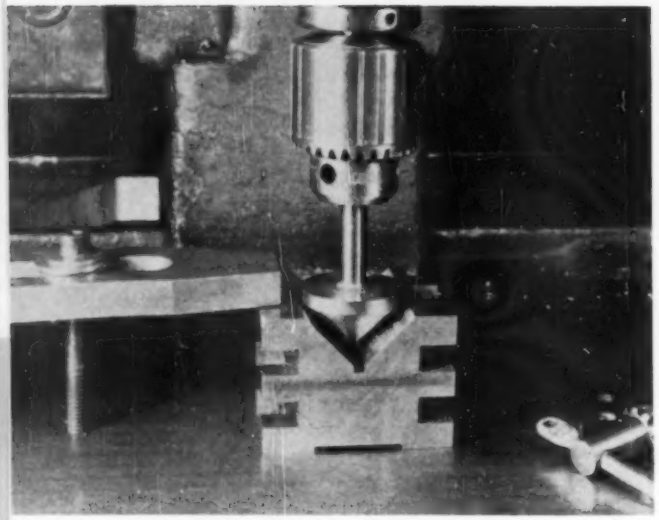


**Fig. 7. Used inserts, worn on corners during turning operations, can be re-used as in this plunge cut on the outside diameter of a compressor disk.**

# Gadgets

Ingenious Devices And Ideas To Help The Tool Engineer In His Daily Work



## Centering Tool

Sometimes it is necessary to drill a hole exactly on a diameter of a round workpiece. Usually a V-block is used to support the workpiece. Precise alignment of the V-block with the spindle of the drill press is essential. Alignment is facilitated by the use of the centering tool illustrated.

The tool has a conical end which is ground to a 90-degree included angle. This end is perfectly concentric with the shank. The shank can be straight for insertion in a drill chuck or tapered for insertion directly in the spindle socket of the drill press. The latter method is preferable since most drill chucks do not run perfectly true. After the V-block is aligned it is clamped in place so that alignment is maintained.

*H. J. Gerber*
*Member-at-Large*
*Stillwater, Okla.*

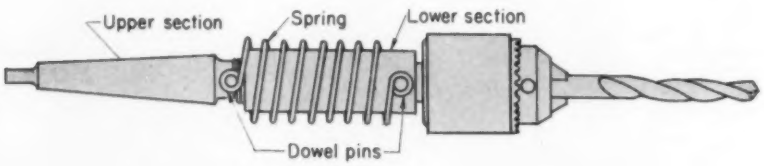
## Spring Drill Holder

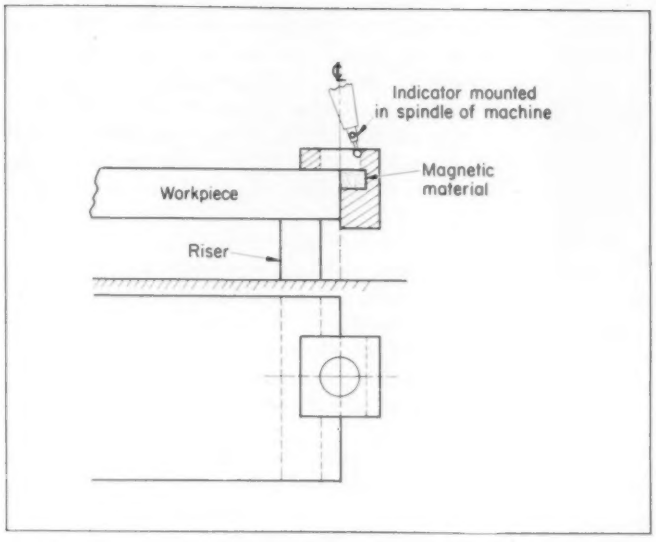
Drill breakage on a production operation where deep holes are drilled in tough stock was reduced considerably through use of a spring drill holder. This device eases the tool out of the cut when the pressure becomes excessive. The holder is made up of two sections which are threaded together. The upper member has a tapered shank to fit the drill press spindle and the lower member carries a drill chuck. A dowel pin is pressed into each section to hold the heavy spring which transmits the driving force.

The spring is wound with a close spacing on the coils so that when in place on the tool it tends to pull the lower section of the holder up. This removes any vertical play from the threads.

In use, drilling torque keeps the spring wound up slightly. When the torque requirements increase the spring winds up a little more as the lower section rotates about the upper section. This rotation lifts the lower section slightly and thus eases the pressure. A coarse pitch thread is used so a small rotation will provide a considerable amount of lift.

*Henry George*
*Yonkers, N. Y.*






## Edge Finding Tool

Jig boring operations can be expedited through the use of a simple edge finding tool which consists of a steel block machined to the shape illustrated. The holding face is on the exact center line of the hole in the tool. An insert of magnetic material in the holding face keeps the tool in contact with the workpiece, eliminating the possibility of tool movement.

*O. E. Mueller*
*Long Beach Chapter*

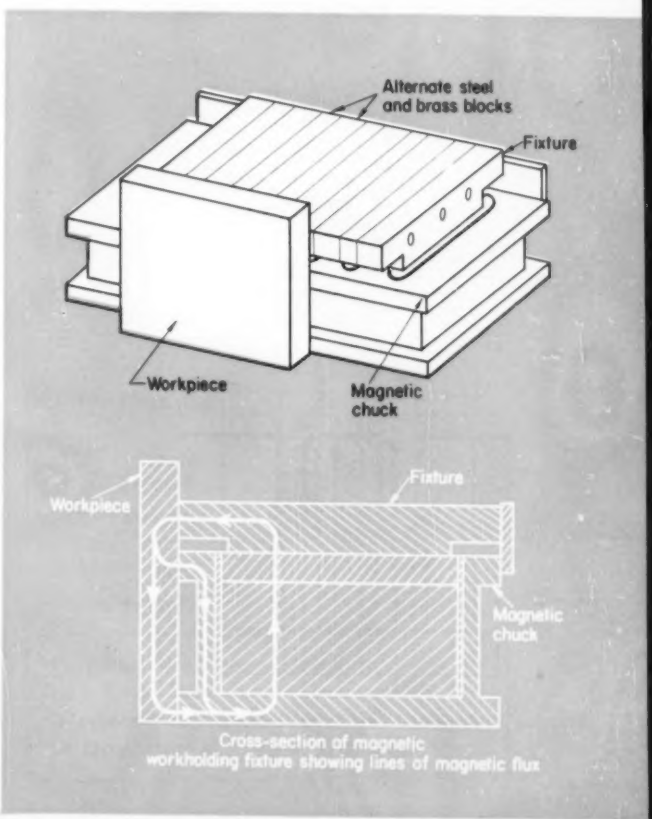
## Magnetic Work-Holding Fixture

Grinding the edges of die blocks and fixture bases is usually accomplished by mounting the workpiece on angle plates or in a toolmaker's vise. Sometimes the combined height of the chuck and the workpiece exceeds the capacity of the grinder.

This type of operation can be facilitated by making up a fixture which holds the workpiece against the front edge of a magnetic chuck in a vertical and square position. The fixture is made up of alternate steel and brass bars fastened together with steel rivets. Dimensions of the blocks are such that each steel block rests in the center of one of the magnetic pole faces on the chuck, and the ends of the blocks are cut away so that they do not contact the face between the poles. The steel plate on the back edge of the chuck is replaced by a brass plate. After assembly the fixture is ground so that it is exactly the same width as the chuck.

When the workpiece is placed on the front of the chuck the magnetic flux comes up from each pole to the steel block and passes through the block into the work and then through the work back into the chuck face and chuck base. The fixture provides a good grip on the work and performs equally well on electromagnetic and permanent magnet type chucks.

*Ernest Jones*
*Bronx, N. Y.*



Cross-section of magnetic workholding fixture showing lines of magnetic flux

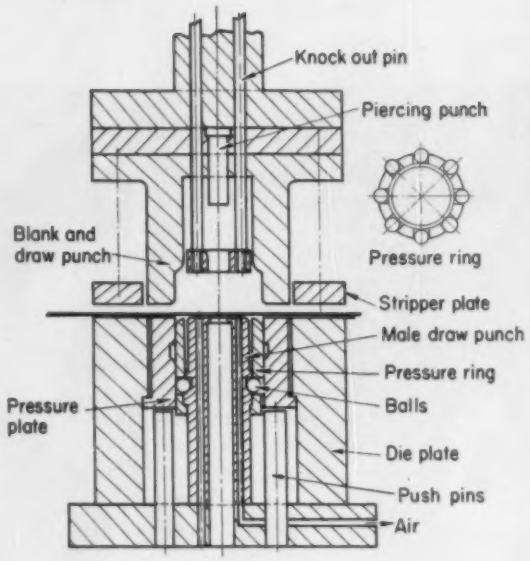
## Combination Die

Five operations are performed on one die which has several novel construction features. The operations are blank, one-inch draw, two-inch draw, pierce and pinch. As the ram of the press descends, blank and first-draw operations are accomplished by one punch as shown. The pressure plate is forced down until its groove is in front of the balls in the pressure plate. This action releases the pressure ring from the male draw punch, allowing the pressure ring to move down with the pressure plate.

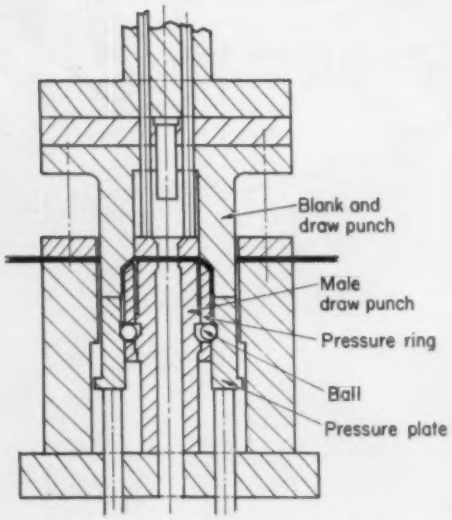
The blank and draw punch continues to descend and performs the second-draw operation. At the end of the stroke the piercing punch goes into action and the blank and draw punch comes into contact with a projection on the male draw punch, pinching off excess metal from the bottom of the workpiece.

On the upstroke the cycle is reversed and the balls are returned to their original position. Parts are ejected from the die by compressed air which passes through the male draw punch. Air is also used to remove punching scrap. Knockout pins strip the workpiece from the upper section of the die.

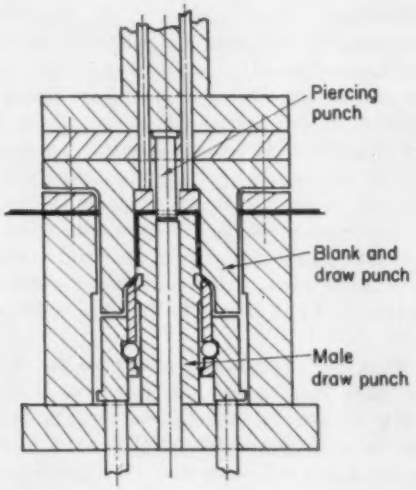
*W. Lateste*
*Dorval, Quebec, Canada*




Combination Die in Open Position

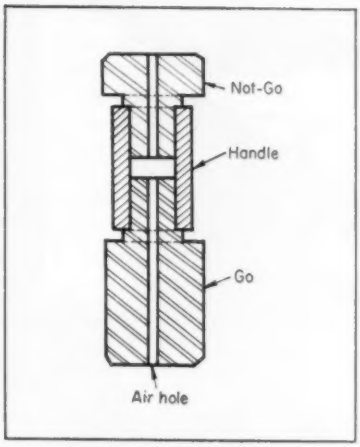



Blank and First Draw Operation




Second Draw, Pierce & Pinch Operation

# Gadgets




## Air Holes for Gages

Conventional go, not-go gages give some trouble when used for inspection of blind holes. The air trapped in the hole hinders the free movement of the gage and detracts from the right feel. Incorporating an air hole into the design of the gage minimized this difficulty.

*Federico Strasser*
*Santiago, Chile*

## Retaining Ring Groove Milling

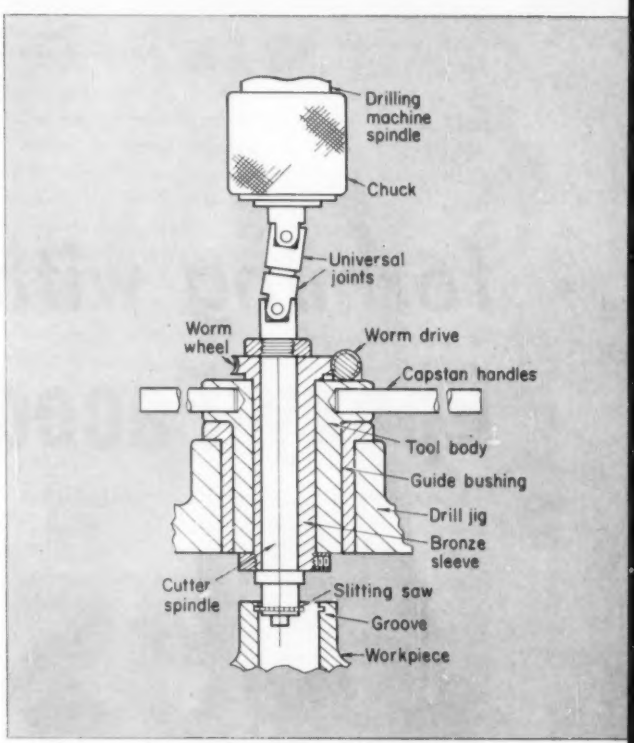
Grooves cut to accommodate retaining rings of the spring-clip type must be of correct depth, and must have sharp corners and parallel sides. When single-point grooving tools are used, they are necessarily of small size. Conduction of heat away from the cutting edges is poor owning to the small mass of such a tool tip and the rate of cutting must be slow to prevent burning. Great care in grinding such tools is mandatory, leading to high grinding costs.

An alternative is to mill the grooves on a drilling machine with a standard slitting saw, as shown in the illustration. In this setup the cutter spindle is connected to the drilling machine spindle by two universal joints. The cutter spindle is housed within a bronze bushing, which is in turn housed in the tool body. The axis of the cutter spindle is offset from that of the bronze sleeve. If the sleeve is revolved on its axis, the center line of the cutter spindle will move toward or away from the center line of the bore in the workpiece.

In operation, the cutter is traversed slowly around the periphery of the bore of the workpiece by rotating the tool body with the handles. Depth of cut is adjusted by means of a simple worm drive. To adjust the depth of cut, the operator holds the tool body stationary with one of the capstan handles, while turning the worm drive.

Use of a slitting saw instead of a single-point tool has insured accurate grooves with long cutter life and considerably increased speed of the operation.

*C. T. Bower*
*London, England*




***Contributions for these pages describing short cuts for the tool engineer are welcome. Finished drawings are not necessary. Payment for accepted articles is made upon publication.***

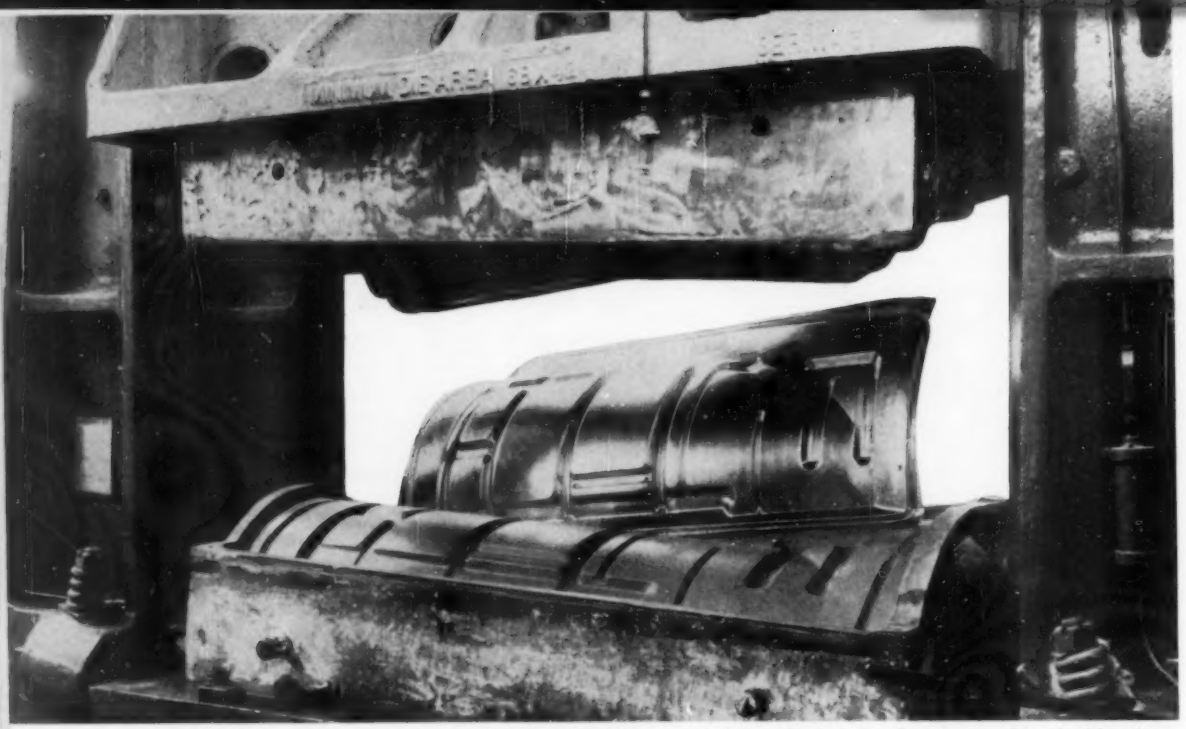


**Fig. 1. Plastic-faced metal punch and die forming a skin doubler from 0.040-inch aluminum. Workpiece is shown being removed from the die.**

# *forming with* Epoxy-Faced dies

**By John Delmonte**

**General Manager**
**Furane Plastics, Inc.**
**Los Angeles, Calif.**

SUCCESSFUL FORMING and drawing of sheet metal by plastic-faced metal dies has demonstrated the remarkable durability and versatility of this relatively new application of epoxy resins *Fig.* 1. Through appropriate reinforcement or formula modification, mechanical properties of epoxy plastics can be adjusted to meet particular metalworking requirements. These include controlling properties such as stiffness and resiliency. The resilient surface of flexible epoxies provides good ironing qualities which are necessary in the proper forming of many products. Also, because plastics can be cast to size, it is possible to produce accurate reproductions of plaster, wood, metal patterns or molds without the necessity of further finishing operations.

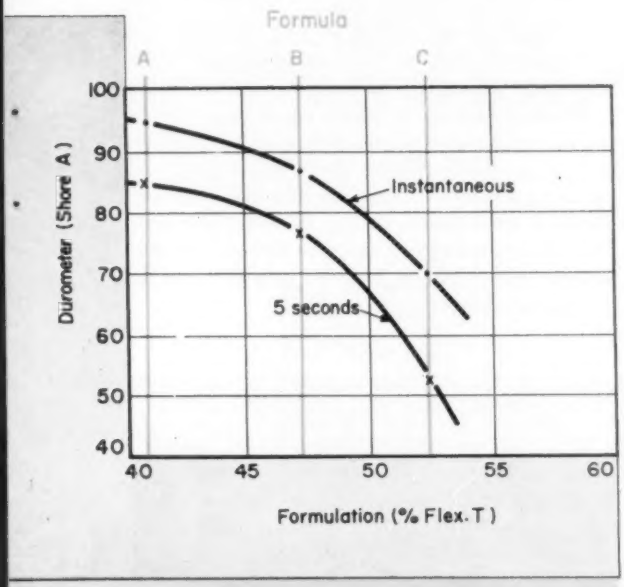
One advantage of plastic facings is that the rapid setting allows the possibility of placing the tool in operation in from 24 to 48 hours. However, unless a heat-resistant epoxy is used, most die facings must be used at room or moderate temperatures. Repair or replacement is accomplished easily by the use

of an epoxy cure, at room temperature, aided by a heat lamp.

**Metal Cores:** Forming or drawing of steel imposes limitations upon plastic die facings. Unless they have steel inserts at wear points to give strength and stability, or are glass fabric reinforced for toughness, their productivity is very limited. Also, with this reinforcement, creep tendencies are reduced to a minimum.

It must be remembered that filled cast plastics have greater expansion coefficients than steel, as shown in TABLE 1. Where cast facings are employed, as in the forming of aluminum, a resilient punch facing of ⅜ to ¼ inch in desirable. Although opinions differ as to optimum resiliency, a Shore A Durometer of 80 to 95 has been used with excellent results. To show the effect of formulation, the chart in *Fig.* 2 indicates instantaneous and 5-sec. readings for three compounds.

One of the most useful criteria to be considered




**FORMULATION**

| Formula | Epocast 9A | Flex. T | HN-9A |
|---|---|---|---|
| A | 100 | 80 | 10 |
| B | 100 | 100 | 10 |
| C | 100 | 120 | 10 |

**Fig. 2. Relative resiliency for three formulations of epoxies. Different properties were obtained by varying the amount of flexible epoxy.**

**Table 1—Typical Thermal Expansion Coefficients**

| Material | Temp Range (deg C) | Thermal Coefficient (in./in./C x $10^{-6}$) |
|---|---|---|
| Aluminum Alloy | 20-100 | 22.0 |
| Zinc | 10-100 | 26.3 |
| Cast Iron | 10-100 | 11.4 |
| Unfilled Epoxy (Cast) | 20-50 | 80.0 |
| Laminated Epoxy (Epocast 2B) | 20-50 | 10 |
| Filled Epoxy (Epocast 4B) | 20-50 | 38 |

is the compression modulus of elasticity. By using an epoxy with elasticity lying between 2000 and 6000 psi, it is not always necessary to provide die clearance for metal thickness in simple forming operations. However, where steep draws and narrow channels are involved, it is desirable to provide clearance for metal thickness and not to rely on the resiliency of the punch facing. The same reasoning applies to plastic die facings for steel forming. Experience has shown, among other things, that some resiliency in the laminated punch facing will also prolong tool life.

One point to remember when using metal cores in plastic facings is that the core face must be thoroughly cleaned before pouring die-facing epoxy. Sandblasting with clean sand is recommended. This provides a strong bonding surface allowing for more trouble-free operation. Tooling materials such as Kirksite, lead, cast iron and aluminum alloy cores are reclaimable, thus cutting down over-all manufacturing expenses while providing strength and wearability at points that do not necessarily need the physical characteristics of steel.

Although plastic itself is adequately weather-resistant, outside, unprotected storage is not encouraged. Thermal expansion differences may cause the facing to separate from the metal and abrasive dust may mar the working face.

**Application:** An example of a metal-forming tool is shown in a die, *Fig.* 1, for forming and drawing an aircraft skin doubler from 0.040-inch aluminum. As a short run was anticipated, cast tools were considered with the thought of reducing over-all manufacturing costs. The necessity of using a starter die was eliminated due to the rubber-like epoxy punch facing.

If a lead punch were used, it would have to be repoured after forming approximately 10 parts due to blunting and broadening of critical radii. Repairs, however, on the cast plastic facing may not be required until 50 or 100 strikes have been made. In addition, repairs can be performed quickly without removing the tool from the press.

Over-all dimension of the doubler is 3 by 5 feet, with some sections showing a 3-inch depth of draw. The punch is a Kirksite casting faced with rubber-like epoxy (Epocast 9A) to a depth of ½ inch.

The die is faced with aluminum colored Epocast 4D from $\frac{3}{8}$ to $\frac{1}{2}$ inch in depth.

A 3-stage operation produces the parts in the following manner: A rubber blanket is inserted under the blank and a strike is made. At the high points, the rubber squeezes out and a broad radii is established. This procedure eliminates the necessity of a starter die. The second operation, with the rubber removed, forms the metal to within $\frac{1}{8}$ inch from bottoming. This is attained by stops placed along the periphery of the tool. The aluminum doubler is then heat-treated before the final operation.

In the final operation, the same tool, with flexible epoxy facing, gives a final strike to the metal part, bottoming in the die. The radii are sharply reproduced without tearing the metal because hydrostatic pressure is exerted by the resilient plastic facing.

**Conclusions:** It is difficult to generalize the advantages and disadvantages of plastic-faced tools. They are highly adaptable to short run or limited production run tooling, depending on complexity of the parts and the severity of the metal-drawing operation. One should not expect the impossible from them because they are not a panacea for metal forming. Furthermore, before using them for involved metal-forming operations, one should develop experience with simple pieces where plastic tooling is justified. In this manner, cost savings may be realized by the careful application of plastic-faced tools.

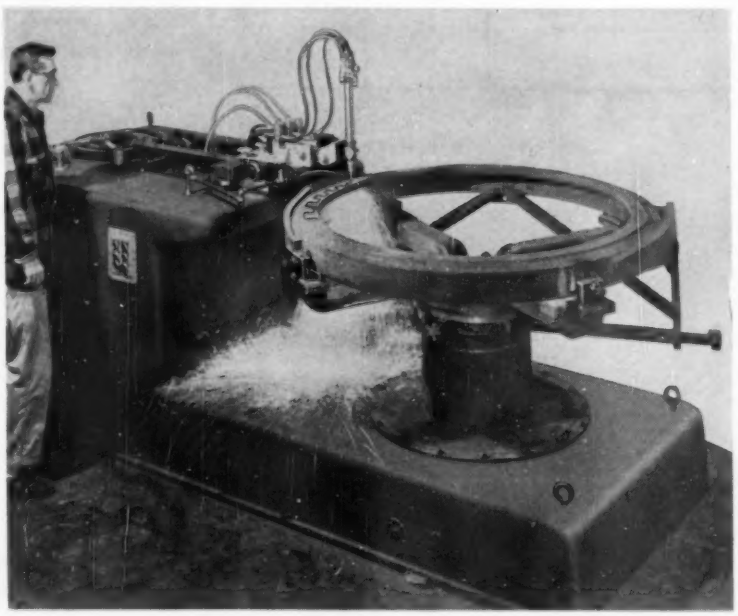
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## *Machining by Flame*

Teeth on large sprockets and gears are cut with speed and simplicity with equipment used in a process called Cogmatic flame machining. The method, developed by Seaman-Andwall Corp. of Milwaukee, involves precise control of a fast-cutting torch, moving on machined ways over the metal blank. The torch is guided by a special cam for control of tooth shapes, sizes and spacings through a pantagraph mechanism.

Machining is automatic and accurate to tolerances ranging from $\pm$ 0.007 inch on smaller sprockets to $\pm$ 0.015 on larger ones.

Particularly adaptable to larger sprockets and gears, the equipment can handle diameters up to 100 inches and up to 3-inch thicknesses. Harder metals appear to offer no handicap. The single operation involved produces pieces that normally require no boring or machining for final finishing. Result is considerable savings in time. This economy is furthered by cost savings which the company claims increase almost in direct proportion to the size of sprockets or gears produced.



**Teeth are being cut by the flame machine in a large diameter internal gear used in road grading equipment. Work was completed in less than 30 minutes with only a single operation required to produce the teeth to close tolerances. By conventional methods, the part required previously an hour and 7 minutes of cold machining time after the inside of the ring was first bored.**

# dressing FORM GRINDING WHEELS for precision production

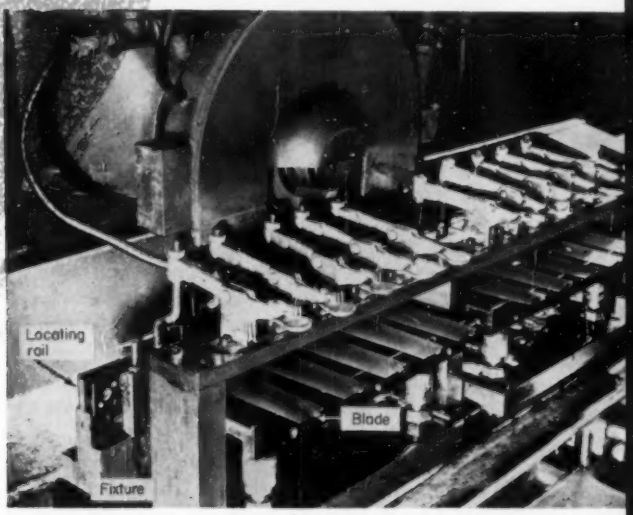



**Fig. 1. Setup for grinding groove in compressor blades. Locating rail can be seen protruding at lower left side of fixture.**

**By J. L. Bryant**
**Process Engineer**
**Allis-Chalmers Mfg. Co.**
**Terre Haute, Ind.**

INITIATING PRODUCTION of a compressor, a major component of the Curtiss-Wright turbo-jet engine, created many new problems for process and tool application engineers at the Terre Haute plant. Production of blades for the stator assembly is particularly important since approximately 1500 blades of various sizes are needed for each compressor. The blades are anchored by a small V-shaped groove in the base of the blade. This groove is produced by a form-grinding operation, *Fig.* 1.

Size, form and location of the groove are critical for proper function of the compressor. Even a slight error in root form is greatly multiplied at the blade tip, as indicated in *Fig.* 2. Such deviation is termed "lean." The amount of lean is dependent on the length of the blade and location of the groove. For example, on a tenth-stage blade, if the form is off 0.001 inch at the root, this error will cause a lean of approximately 0.007 inch at the checking point, while an entrance-stage blade will lean about 0.013 inch for each 0.001-inch error.

The form of the groove must be accurately located and have a true profile within 0.0005 inch to secure proper fitting of the blades into their rings on assembly. Excessive lean in either direction may cause interference between the stator and rotor blades. An incorrect form on the blades results in looseness. Either condition would result in engine failure.

The problem of consistently reproducing these blade root forms accurately to within 0.0005 inch of true profile in large quantities is a difficult task. In aircraft work, the requirement of quantity production within a specified time is vital, adding urgency to other problems.

Part of the solution to these problems is the fixture shown in *Fig.* 1 which is designed to locate the

**Abstracted from paper 24T15, "Diamond Dressing of Form Grinding Wheels," presented at the 24th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society headquarters.**

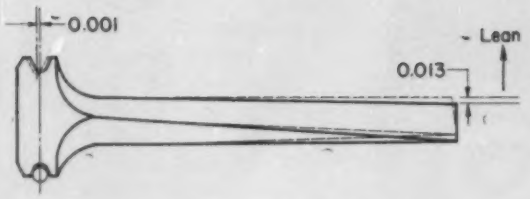



**Fig. 2. Outline of compressor blade showing multiplication of error at tip caused by slight variation in groove.**

blade on the pitch plane of the lower groove while the top groove is being ground. This is accomplished by means of a locating rail with a 0.04697-inch radius. To assure proper location of the blade, a semisoft wheel is placed on the grinder and dressed to a 0.04697-inch radius. This is the wire size required to locate on the pitch diameter of the blade, The rail on the fixture is then ground to obtain perfect alignment between the fixture and the machine.

The grinders are equipped with dressing attachments which are vertical pantographs with a ten-to-one ratio between the template and the dressing diamond. Thus, it is simple to transfer the form to the wheel when the dressing attachment has been correctly located on the grinder. The desired form is transferred to the grinding wheel by tracing the contour of the template shown in *Fig.* 3.

Machines used for this precision grinding operation are small surface grinders. They must be accurate and the spindle must run true. A warm-up period of about two hours is required before grinding can be accomplished satisfactorily. The warm-up period allows the machines to stabilize at normal operating temperature and nearly eliminates the problem of expansion due to temperature changes.

A standard 10 x 3/8-inch, 80-grit resinoid-bond grinding wheel is used for form grinding blades. This was selected after experimentation with several different grinding wheels. The company originally received diamond dressing tools with each dressing attachment. It was found, however, that the diamond tools supplied were not satisfactory for the particular job. This was indicated by the large quantity of diamond tools used each month.

Diamond usage was extravagant and the life of a diamond was frequently insufficient to complete the form of one wheel. The reasons for excessive usage were found to be due to the following conditions:

1. Design specifications of the diamond tools were unsuited to needs.
2. Insufficient control of diamond tools.
3. Misuse of diamond tools.

The first problem encountered was improper alignment between the flat on the shank and the center line of the radius. Unless the diamond radius was in proper relation to the flat on the shank, as shown in *Fig.* 4, the diamond would not be square with the wheel when mounted in the dressing attachment. The back part of the diamond would then drag against the wheel and ruin the form.

Another serious problem was encountered when the tools did not have a true 0.005-inch radius and the diamond edges were not smooth. It was absolutely necessary to correct these conditions before the tool could be centered in the dressing attachment.

In placing the diamond tool in the dressing attachment, it is necessary to indicate the radius within 0.0002 inch. If the edge of the diamond is chipped or the diamond is not yet symmetrical within the holder, a false indication is given when the diamond tool is set up. To arrive at specifications for diamond dressing tools, the form to be obtained, the type and size of wheel to be dressed, and the accuracy and finish requirements of the part were considered.

The diamond tool block shown in *Fig.* 5 holds the

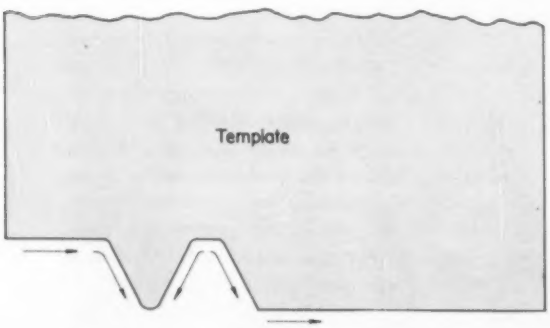



**Fig. 3. (above) Template contour. Arrows show proper directions for dressing the grinding wheel.**

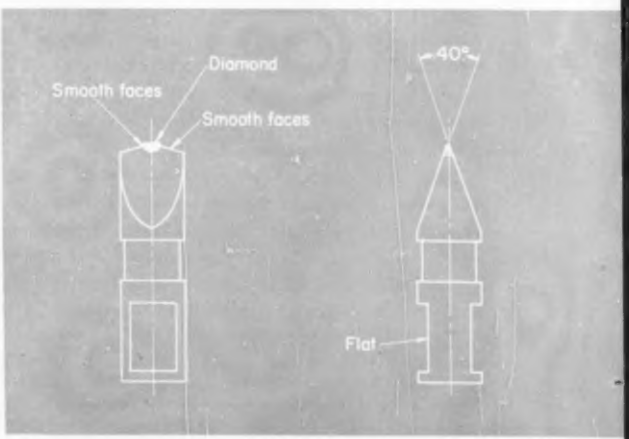



**Fig. 4. (right) Original diamond tool used for form dressing grinding wheels.**

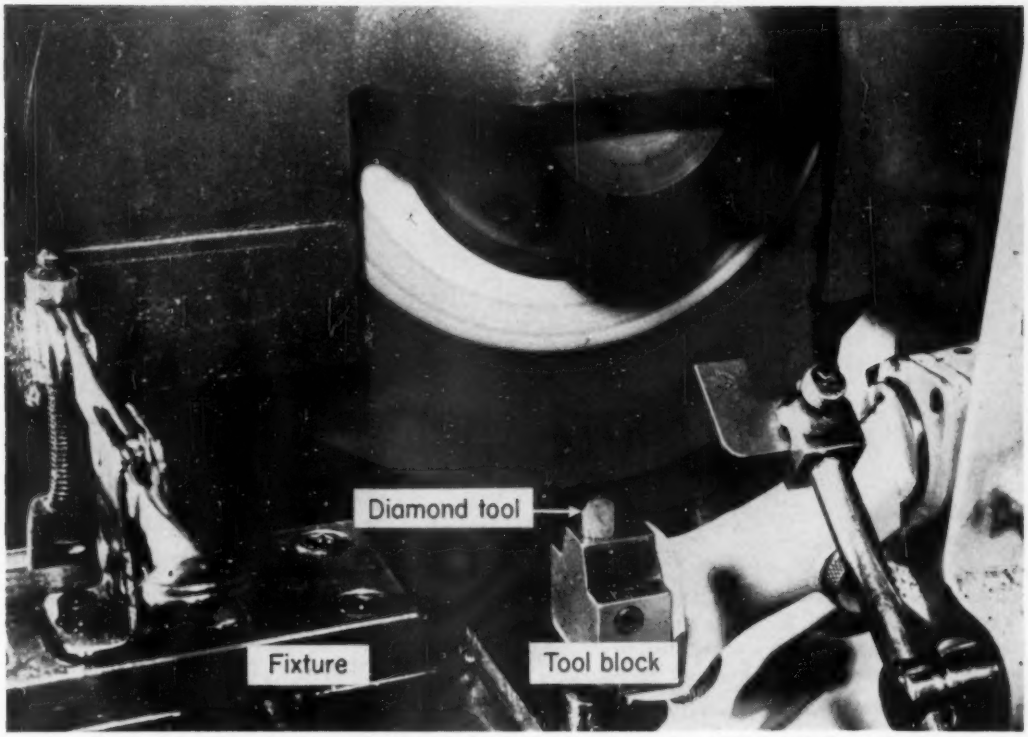



**Fig. 5. Setup for dressing grinding wheels showing location of tool block and diamond tool**

diamond at an angle of 5 deg in the direction of wheel rotation. This permits use of both radii for the dressing operation. Therefore, both edges must be absolutely true and free of chips.

When the diamond is rotated about its axis, as shown in *Fig.* 6, the indicator pointer should remain on zero or show a slight but equal movement on either side of zero. If the radius edge is not smooth, a false center could be located resulting in an incorrect form on the wheel.

The physical size of the groove requires an included angle of 40 deg or less on the tip of the diamond. Experimenting was done with 30, 35 and 40-deg included angles. The 30 and 35-deg tools produced fewer wheel dressings than the 40-deg tools. The shortened life was due mainly to the reduced cross sectional area of the diamond. It was also found that at 30 and 35-deg included angles, the diamonds had a tendency to break loose from their mountings at lower pressure than with a 40-deg included angle. It was decided, therefore, to use the 40-deg included angle to give added strength.

This included angle is critical because it allows only a few degrees clearance between the included angle of the groove and that of the tool. Since the dressing operation is manual, the operator may allow the side of the diamond tool to hit the opposite edge of the groove unless he exercises care. This was one of the major causes of diamond breakage. To eliminate this damage, operators were trained for the manual dressing operation.

As a result of experience with these problems, the original design of the diamond tools was modified to suit the conditions encountered. Each succeeding change in the diamond tool, while of minor nature, was a factor in increasing life and lowering cost.

At first, it was considered necessary to lap the small side faces of the diamond. This was difficult to accomplish due to the nature of diamonds and was quite impossible when finishing the tools. By changing the profile to 45 deg as shown in *Fig.* 7, it was possible to lap the sides of the diamond more readily and reproduce a shape that could be indicated accurately.

The simple procedure of rotating the diamond 180 deg to use the opposite edge was overlooked in the early part of the form grinding program. Consequently, only half of the diamond was used. At the outset of the program each operator was responsible for setting up and dressing his own wheel. The operator was also free to withdraw diamond tools from the crib. This proved costly because insufficient care was given the diamond tools.

One man was then placed in charge of the setup and dressing of the wheels. This resulted in improved life of diamond tools through consistent dressing procedures and proper use. It also placed upon one

man the responsibility of determining when a diamond was no longer usable and when it should be returned for relapping.

Some of the most common misuses of diamond tools were found to be:

1. Incorrect motion in dressing.
2. Using a 0.005-inch radius finish diamond for rough dressing.
3. Use of too much feed while dressing.
4. Incorrect usage of coolant.

During the dressing operation, care was exercised to always pull the diamond across the wheel. In dressing the form, the diamond was moved as shown in *Fig.* 3. The correct cycle of dressing motion never points the diamond into the wheel, which would result in serious damage to the wheel, chipping of the diamond or possibly unseating of the diamond from its mounting.

To rough dress a grinding wheel, a roughing diamond of about 0.020-inch radius is used. A finish diamond of approximately 0.005-inch radius that is no longer usable for finish dressing can also be used to rough or semifinish a wheel. Before a finish diamond is used for rough dressing, the following points should be considered:

1. The time required for rough dressing a grinding wheel with a 0.005-inch radius diamond will be greater than with the roughing diamond. The time increase should be compared with the time required for changing the setup to allow use of a roughing diamond.
2. The finish dressing diamond wears rapidly during roughing operations. The diamond may wear beyond the point of salvage making it unfit for relapping.

It was found that a feed of 0.0001 to 0.0002 inch and a speed of 2300 rpm for semifinish and finish dressing allows the optimum use of a diamond tool.

When dressing is done with a coolant, flow should be copious. Interrupted coolant flow on the diamond subjects the diamond to thermal shock causing serious damage.

To assure the operator that the wheel has been correctly dressed, one blade is placed in the fixture and ground to size. The blade is then checked in an optical comparator at 32¼X. If the form is true and within the tolerance of 0.0005 inch of true form, the blade is placed in a gage to check for lean. This gage indicates whether or not the form is correctly located on the blade root. If both items check to print specification, the operator proceeds to grind blades until the form varies from true form. The length of time a form on the wheel will hold up depends upon the feed the operator employs and upon the amount of stock to be removed from the blades. Under normal operation a properly dressed wheel produces good parts for a period of twelve to sixteen hours before it requires redressing.

Since the start of the program three years ago, usage of diamond tools has been reduced approximately 45 percent. This was accomplished through proper training, improved design and better control of diamond tools. Efficient grinding can be developed only by an understanding of the factors involved, and cooperation of design and production engineering, and supervision.

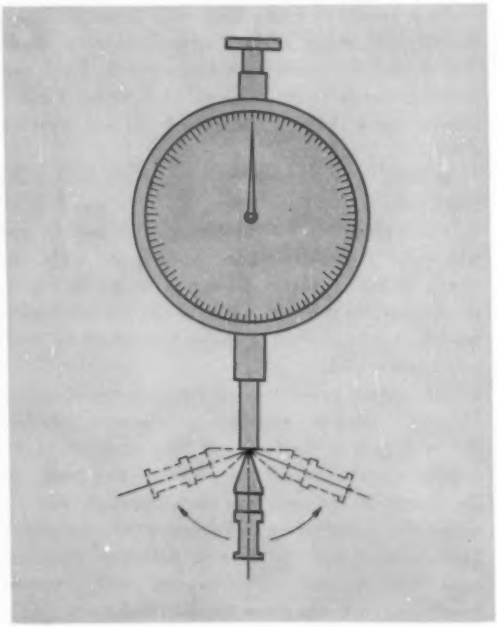


**Fig. 6. (above) Rotation of diamond to locate center using indicator.**

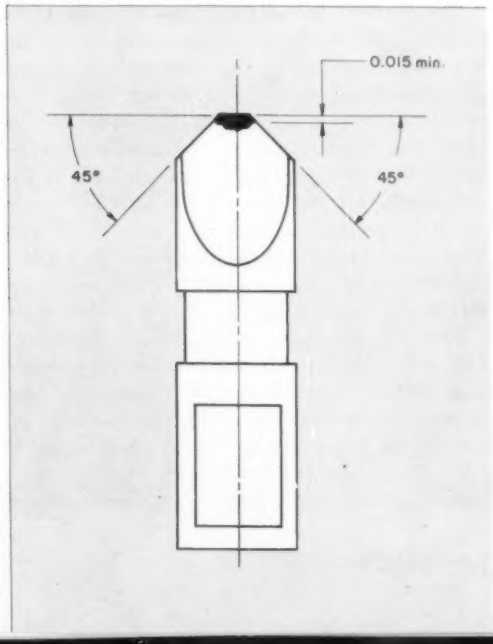
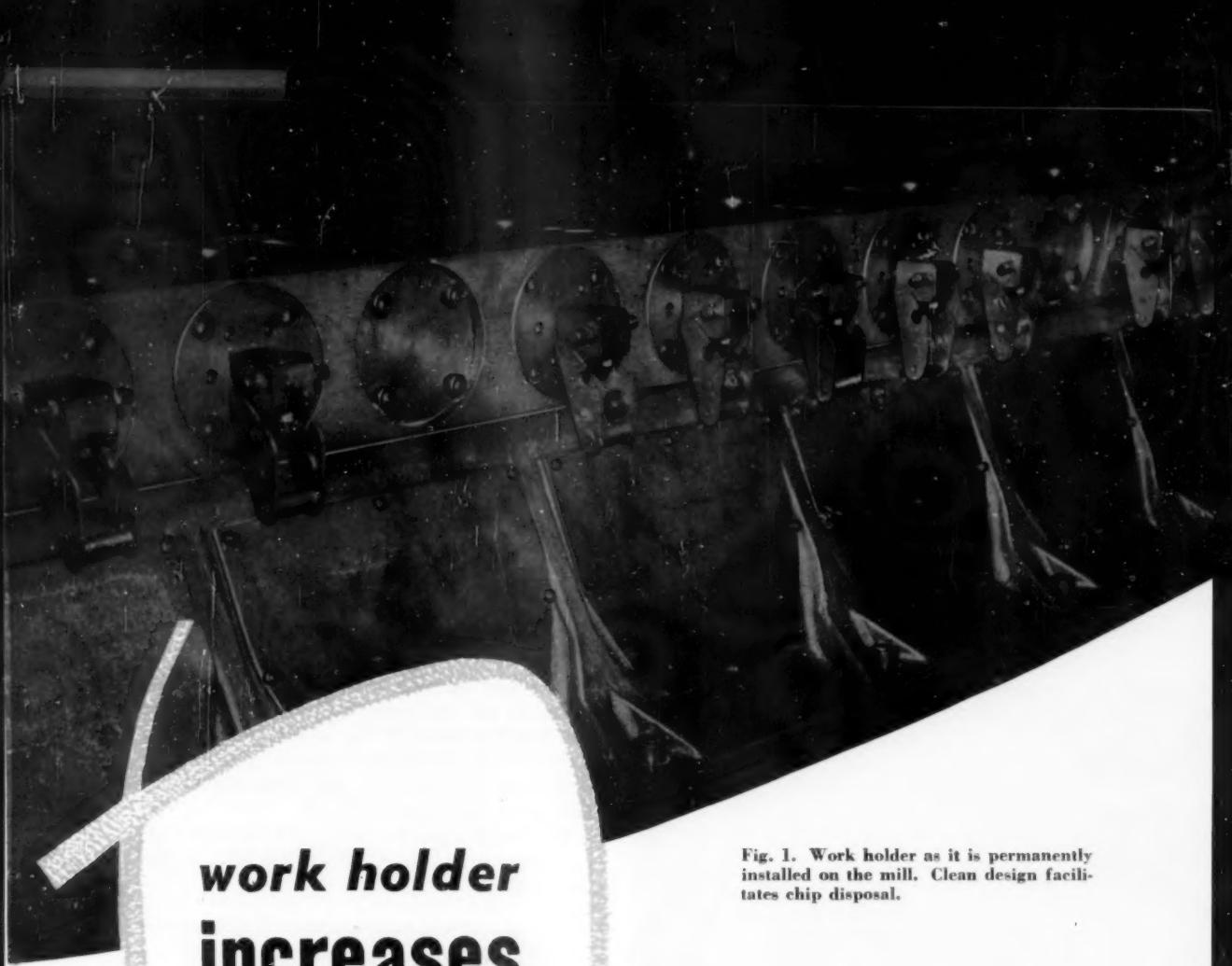



**Fig. 7. (right) Revised shape of diamond tool to provide more accurate indicating of center.**



# work holder increases mill production

**By R. J. Wendell**
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**Long Beach Div.**
**Douglas Aircraft Co., Inc.**
**Long Beach, Calif.**

**Fig. 1. Work holder as it is permanently installed on the mill. Clean design facilitates chip disposal.**

MAXIMUM UTILIZATION of the productive capacity of spar cap mills is of paramount importance in the aircraft industry. This highly specialized equipment is not only expensive but the operations require large areas of floor space.

When it is necessary to provide additional spar cap mill capacity, still another factor enters the picture—the time lag for delivery. Spar mills, being a specialized type of equipment, are usually built to the users' specifications. Five years ago, the spar cap tool engineering group of the Douglas Aircraft Long Beach Division began a study directed toward reducing spar cap mill down time. This study had the active cooperation of plant engineering, time standards, tool engineering, tool design and manufacturing departments.

It soon became apparent that the greatest loss of production time was in setting up and tearing down the tooling. Design studies were accordingly begun to develop a work holder, *Fig.* 1, that would reduce this time loss. The Long Beach facility consists of 2 wing spar cap and 2 empennage spar cap production lines. These contain 15 Farnham mills, 52 to 75 feet long, 3 taper mills, 6 detail mills, 3 profile mills and 2 twist mills.

Caps as long as 47 feet are in regular production.

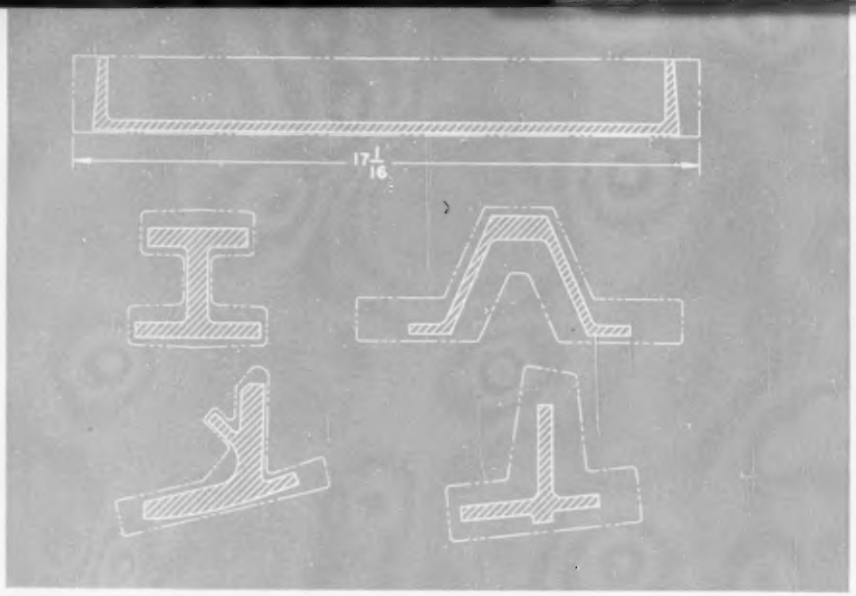
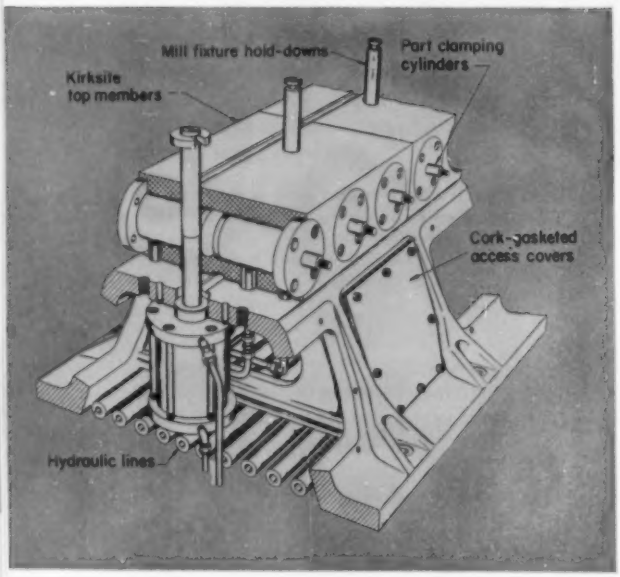



**Fig. 2. (right) Typical cross-sections of spar mill parts.**

**Fig. 3. (below) Cutaway view of work holder. Horizontal cylinders on 5-inch centers locate and clamp workpiece. Vertical cylinders on 10-inch center hold mill fixture.**




Typical cross-sections of spars, keels and spar beam channels, *Fig.* 2, are often complex. One such spar beam measures 17 1/16 inches wide and 350 inches long.

Past experience in attaching mill fixtures to a work holder with screws, indicated that it was a time-consuming operation. A time factor of 0.054 hour per lineal foot of fixture was required for setup, and teardown time consumed an additional 0.032 hour per foot.

At capacity, an average of 1920 feet of mill fixtures are set up each week on the 15 Farnham mills; thus, a total of 165 mill hours a week are consumed on setup and teardown. As the total available mill hours per week is 1200 hours, the screw attachment of mill fixtures consumed 13.7 percent of total mill time.

Manual location of parts on the mill fixture, employing lead hammers and supplementary clamps, consumed an additional 10.8 percent of the total mill hours available. It was evident that potential savings amounting to 24.5 percent of production time could be achieved through the development of faster setup and teardown.

The first step was the design of a universal high production work holder. Briefly, this work holder encompassed:

- *A means of hydraulically attaching mill fixtures to the work holder
- *A method of hydraulically clamping the work to the mill fixture
- *A device for mechanically locating the work both vertically and horizontally.

Other design specifications of the work holder were:

- *Working pressure of the hydraulic system should not be greater than those found in plant use
- *The material for the top of the work holder should dampen vibration and be readily machinable on the spar mills for parallelism with machine ways
- *The design should aid, not impair, chip removal
- *Mill fixture components should be of a readily machinable size.

Precision location of parts would assure precision duplication of parts. Dampening of vibration would produce better finishes and prolong cutter and machine life. This plan would make available a standard work-holder component that would meet varying requirements. Tooling would be 100 percent interchangeable.

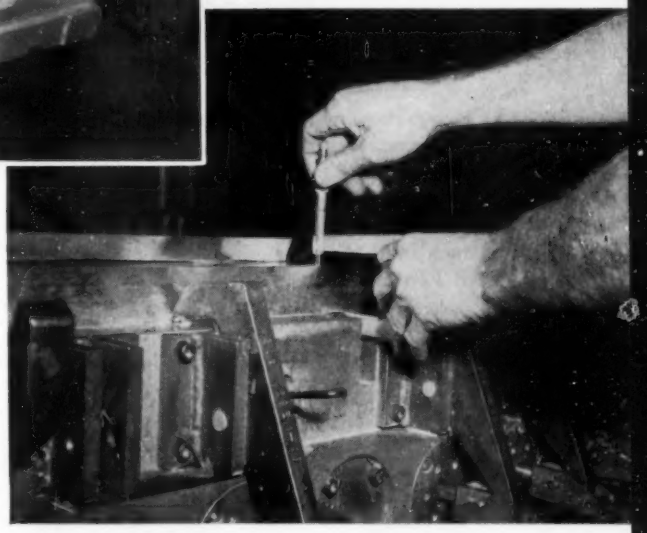
Keeping in mind each recommendation, the Long Beach Tooling Division designed and retooled the spar cap milling facility. After four years of operation it has demonstrated its success.

The work holder, *Fig.* 3, is a cast-iron base with a series of duplicate Kirksite top members, the total



**Fig. 4.** (left) Typical mill fixture segment.

**Fig. 5.** (below) Setup using the gaging slot in the mill fixture. In this arrangement all clamps are out of range of cutting operations.



height of the assembly being 14 inches. The base contains hydraulic lines for five separate systems. The first four systems are used to actuate horizontally mounted hydraulic cylinders which locate and clamp the part. The fifth hydraulic system is used to actuate vertical cylinders which attach the mill fixtures to the work holders.

The mill fixture is composed of a number of duplicate segments, *Fig.* 4, normally 20 inches long. Each segment is precision machined for exact mating. Slots in the base allow for lateral alignment to a key in the work holder.

In setting up, the first mill fixture segment is placed on the work holder against an end stop, which is a cross key in the work-holder top, and over the longitudinal key in the work holder. Successive mill fixture segments are keyed and butted until the entire mill fixture is in place. A cam-actuated, spring-loaded unit engages the last segment in place.

The vertically mounted hydraulic cylinders in the work holder are quickly engaged to the mill fixture segments with "C" washers. This clamps the entire mill fixture assembly securely to the work holder.

The spar cap extrusion is placed against an end stop at one end of the mill fixture assembly with the aid of an overhead crane. Hydraulically operated hold-down clamps swing over the top of the workpieces, firmly pressing the part down onto the mill fixture surface. Other hydraulic clamps push the part laterally against the side locators and clamp the part in alignment.

When the part is thus properly aligned both vertically and horizontally, side clamps hold the part securely for machining. At this point, hold-down clamps for vertical alignment are retracted. Upon completion of machining, the clamps are retracted and the part is unloaded from the mill.

The mill fixtures are machined to provide a one-inch aperture at the junction of the segments. This gives access to the base of the spar cap to facilitate gaging, *Fig.* 5.

As a result of four years' experience with 15 spar mills equipped with this work holder, it is felt the most valuable features are the hydraulic attaching of mill fixtures, the mechanical location of parts and the use of multiple hydraulic circuits which provide clamping flexibility. Utilization of these features has increased production time by 24.5 percent. This was time that was previously consumed in setting up and tearing down tooling and in loading parts in the mill.

While additional mill utilization was also obtained by product design studies directed at eliminating operations and improvements in material handling, the time savings resulting from the work-holder concept alone eliminated the need of purchasing four additional spar mills. These mills, together with supplemental equipment, would cost approximately $975,000.

The purchase of four such machines would have entailed the necessity of providing 15,000 additional square feet of working area which could have been available only by additional construction.

*designed for*

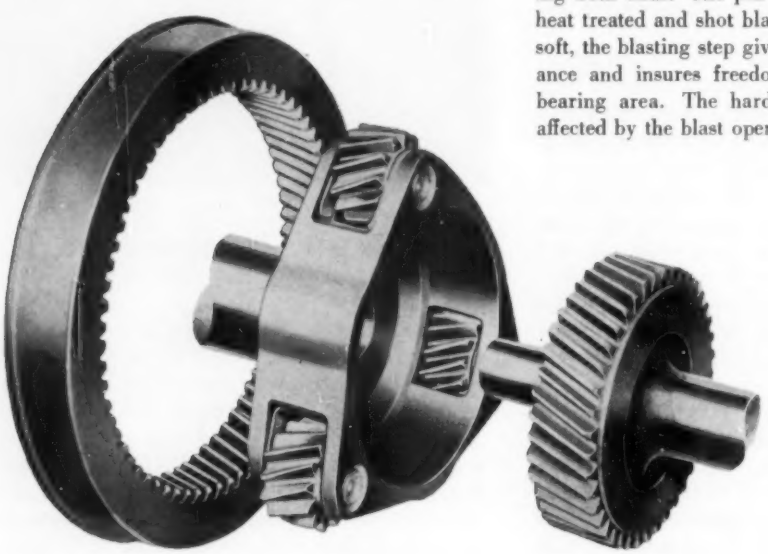
# PRODUCTION

## Inspecting Hardness by Shot Blasting

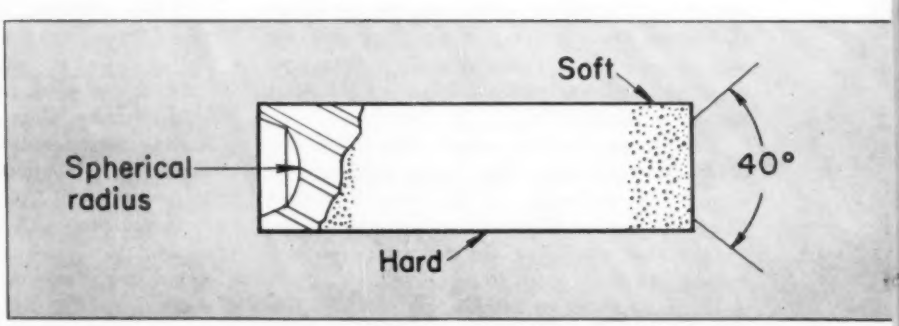
PINION PINS for planetary gear sets must be hard because they act as bearing surfaces. Such pins must also be fastened in the pinion cage, which is difficult with a hard pin. Engineers at Detroit Transmission Div., General Motors Corp., have come up with an ingenious solution for this problem. Part of the pin is hard and the ends are soft.

Formerly, the pin, with a head on one end, was produced on a screw machine. The other end was held by staking and swaging the end, which had been left soft. These pins were made of SAE 8620, copper plated on areas to be left soft, and hardened. Heat treatment was expensive and time consuming in a batching furnace.

Considerable savings have been realized by changing to 1085 steel and automatically cold heading both ends. The pin is then ground, induction heat treated and shot blasted. Because the ends are soft, the blasting step gives the ends a satin appearance and insures freedom from soft spots in the bearing area. The hardened bearing area is unaffected by the blast operation.



PINION GEARS are retained in planetary cages by pins that must be hard for a bearing surface and soft for ease of swaging. Present manufacturing techniques are centered around an induction heating coil that hardens only the bearing area of the pins.




PINION PINS are cold headed and, after heat treatment, are shot blasted. Soft, untreated ends of the pins take on a satin sheen which makes preassembly visual inspection a simple matter.

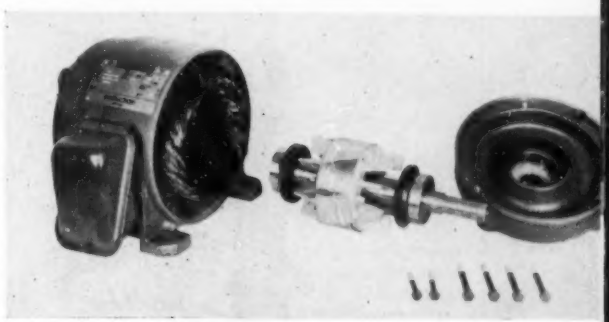
# Synchronous Induction Motor Built on Small Frame

FOR GENENRAL industrial use, the Synduction motor is built on standard induction motor frames and enclosures, and uses a simple die-cast rotor. Designed by Allis-Chalmers Mfg. Co., the motor requires no brushes, slip rings or windings on the rotor. Neither is a separate source of direct current excitation nor special starting equipment needed. For largest ratings, reduced-voltage starters are used.

This motor has several advantages over existing synchronous reluctance motors, and approaches the efficiency and power factor of a squirrel-cage motor. It is not a power factor correcting device since it operates with a lagging power factor. The Synduction motor starts as an induction motor with a high locked-rotor torque, accelerates and pulls into synchronism quickly, then runs as a synchronous motor. Because of its high pull-out torque, the motor remains in synchronism regardless of load or line voltage fluctuations.

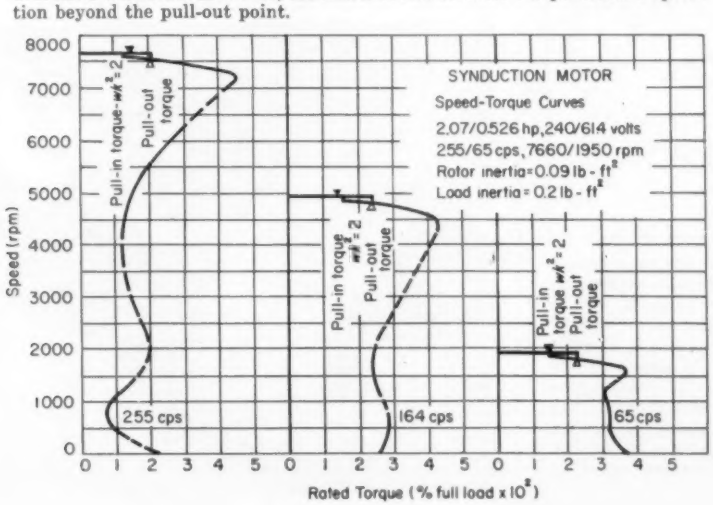
Such motors operate over a wide range of frequencies with a synchronous speed for each frequency. Frequencies of 300 cps and speed above 10,000 rpm are available as are motors for frequencies as low as 10 cps.

These units can be used for constant, unvarying speed, where several units must operate at a fixed ratio of speed, and where several motors must be adjustable over a speed range with minimum variation at any speed setting. It is anticipated that these motors will have wide use in the metalworking industry where automatic cycles and machines must be synchronized.



STATOR is like that of a typical squirrel-cage induction motor. The rotor is made of laminations with die-cast conductors and includes a squirrel-cage winding. Magnetic circuit in the rotor is designed to obstruct the flow of quadrature-axis flux and simultaneously provide maximum flow of direct-axis flux. Difference between the two fluxes is a measure of the torque developed by a motor. Small frame, slots on the rotor and a conventional stator make this motor simple and introduce no production difficulties. For good synchronizing ability, resistance of the cage should be low. Not only are the large quadrature-axis slots filled with aluminum but the direct-axis slots are interconnected with large masses of aluminum.

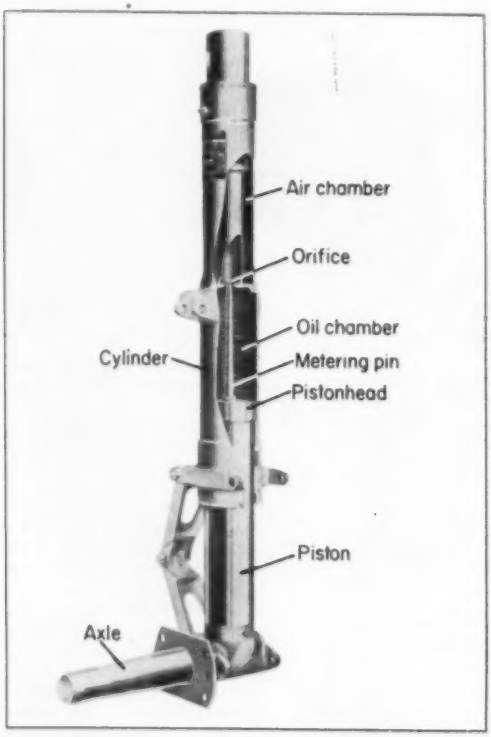
SPEED-TORQUE curves for a typical Synduction motor are shown with widely different frequencies. The load inertia is 2.2 times that of the motor rotor. For the three frequencies shown, pull-in torque averages about 100 percent. Pull-out torque can be adjusted by design. This motor operates as a squirrel-cage induction motor when run beyond pull-out. Slip is present and speed decreases with load. However, the motor is not suitable for protracted operation beyond the pull-out point.



# Plastic-Clad Piston Prevents Landing Strut Seizure

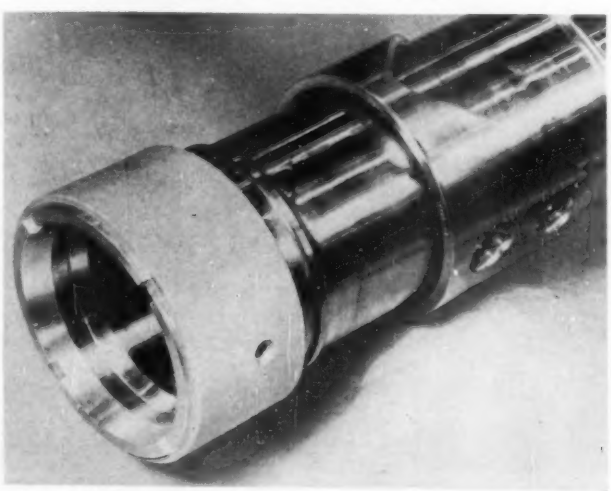
HEAVY-DUTY hydraulic piston weight can be reduced through use of 24ST4 aluminum tubing to which is bonded a thermosetting phenolic laminate. Such units are now used in landing struts for airplanes but point the way toward industrial applications. Cylinders in landing gears are subjected to impact loads and significant changes in temperature so that seizing could lead to serious consequences. Aerol shock struts, designed with the new piston construction by the Cleveland Pneumatic Tool Co., successfully prevent seizure and are lighter than the units they can replace.

Production of piston heads, by Synthane Corp., begins with the knurling of 38-inch lengths of aluminum tubing. The knurled surface provides anchors for the plastic. A continuous length of resin-impregnated fine-weave cotton fabric passes over heated pressure rollers and is wrapped around the tubing. Heat introduced by the rollers starts the polymerization of the thermosetting plastic. Sufficient layers of fabric are wrapped around the tube to provide a machining allowance over the required diameter. Polymerization is completed by an oven cure. After the plastic is machined, the covered tubes are cut to length and the aluminum is machined to specification.




OPERATION of landing strut is simple. Upward thrust caused by ground contact of the wheel, mounted on axle, telescopes the piston into the cylinder. Oil in the oil chamber is forced through the orifice around the metering pin. Hydraulic back pressure is built up in the chamber, depending on the shape of the metering pin, and dissipates the kinetic energy generated by the landing. Flow of fluid through the orifice compresses the air in the air chamber, further resisting the telescoping action. Expansion of the compressed air is controlled by a return valve to prevent excessive recoil.

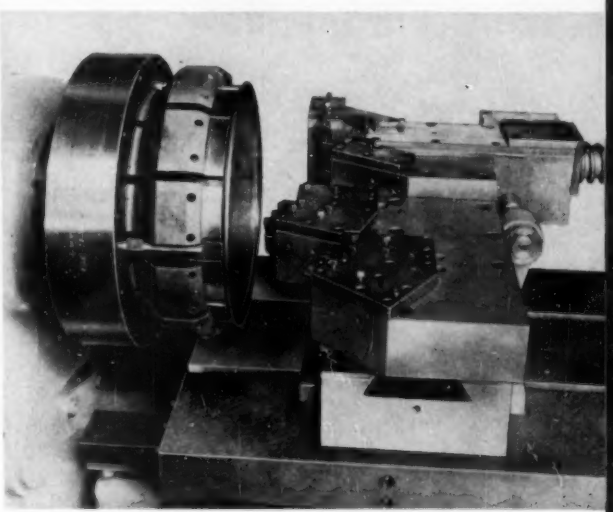
PISTON BEARING, made of phenolic laminate bonded to aluminum, avoids metal-to-metal contact and prevents seizing of the piston in the cylinder. The combination is dimensionally stable, regardless of changes in temperature or the fact that the plastic operates in contact with hydraulic fluid. The phenolic does not absorb enough oil to cause swelling.



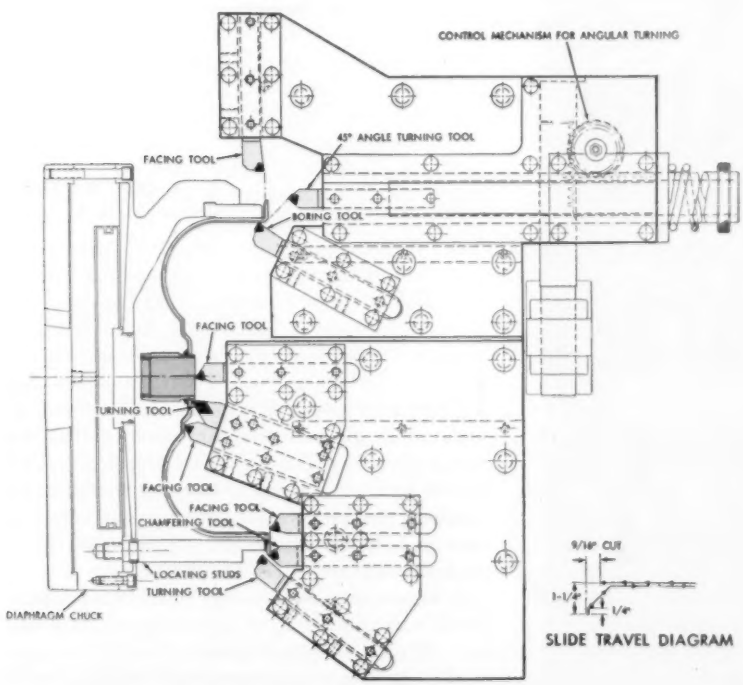
# Platen Type Automatic Lathe
## Cycles Multiple Tooling Fast

DESIGNED for automatic operation as single units or integrated into an automatic line, these platen type lathes quickly cycle multiple tooling. Various types of automatic loading and transfer equipment can be used to achieve the degree of automaticity required.

Tool blocks are mounted on a power-operated cross slide. Movement of the cross slide is controlled by a quick-change mechanism and stroke length can be varied without changing cams. The cross slide base is keyed and bolted to the platen but is adjustable longitudinally through the use of T-slots in the platen. Automatic longitudinal feed for the platen is obtained through a barrel cam housed in the bed of the machine. This lathe, manufactured by Seneca Falls Machine Co., has an 18-inch swing.



PLATEN TYPE automatic lathe equipped for machining a torque converter impeller housing. The stamped workpiece is held and driven by an air-operated diaphragm chuck fitted with wrapping jaws to avoid distortion. The lathe is built with sufficient mass and adequate tool support for high accuracy.




SLIDE TRAVEL DIAGRAM

MACHINING operations consist of turning, boring, facing and chamfering the open end of the housing. The 45-deg angle on the inside diameter of the flange is generated by combining the longitudinal and cross feeds through an independent tool slide fitted to the rear tool block.

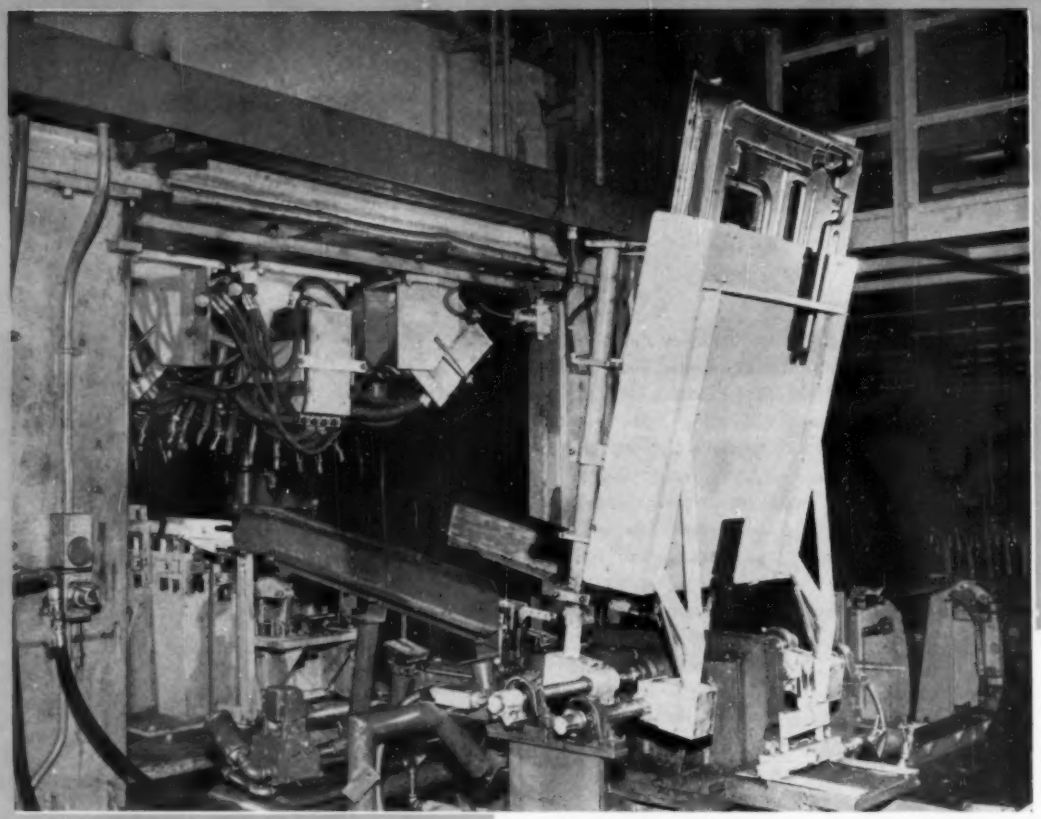


**Fig. 1. Automation extends to welding operations at new Ford plant. Door panels are placed in proper position for entry into spot welding press by an air-powered automatic turnover device.**

# automation and conveyors cut stamping costs at Ford

**By Arthur H. Allen**
**Cleveland, Ohio**

EXTENSIVE CONVEYORIZATION and automation, *Fig.* 1, contribute materially to the efficiency of the Ford stamping plant at Walton Hills, Ohio. Up to 3500 tons of steel daily are processed into hoods, doors, body side panels, roofs, instrument panels and other parts in 1,550,000 square feet of floor space. Total employment averages 3800 workers.

A large indoor steel storage area accommodates 35,000 tons of material, 80 percent in coils weighing up to 30 tons. Overhead cranes are used to transfer stock to the blanking presses, and industrial truck

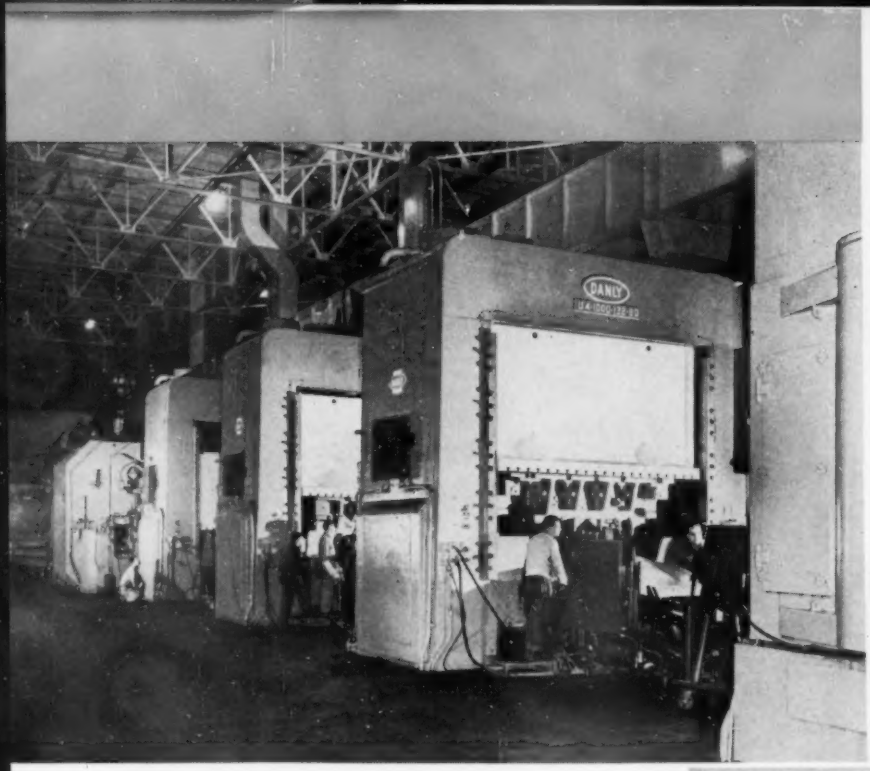
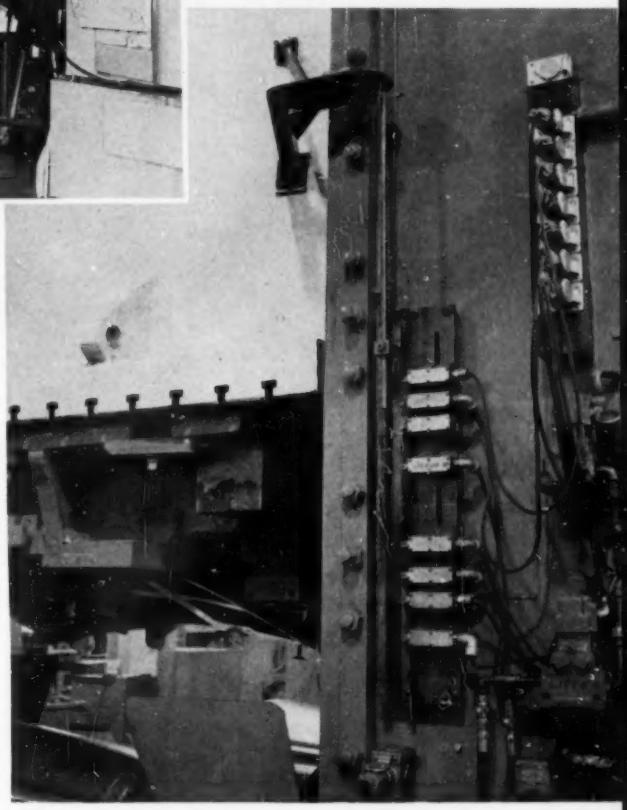


**Fig. 2 (left). Press line for production of hoods. Automation equipment, synchronized with press strokes, carries parts between, into and out of successive stamping operations. Capacity of the presses is 1000 tons.**

**Fig. 3 (below). Electrical controls synchronize automation equipment. Limit switches are actuated by a rod attached to the ram of the press, and are mounted on a slide to permit easy adjustment.**



trailers move blanks to 22 major heavy press lines, through which handling is largely automatic.

**Press Installations:** Typical of these installations is the hood line, *Fig.* 2. After manual loading of blanks for the first forming operation, transfer of parts between presses is accomplished by means of loaders, extractors and conveyors.

There are 107 heavy presses in the plant, ranging up to 1200-ton capacity. Presses are supported on four tiers of steel beams resting on concrete piers, thus permitting easy relocation by removal of floor panels and tie-down bolts and lifting the press away with a crane. Beams are slotted to allow presses to be moved as much as two feet forward or backward in the event that such adjustments are necessary in setting up for a new part. The movable working floor around the presses is made of pecan wood panels 30 inches square and ¾ inch thick, supported on I-beams.

Under-floor handling of scrap helps to sustain a high production rate by keeping the working floor clear and uncluttered. Trimmings from large presses, except where they can be used as stock for presses making small parts such as brackets and reinforcements, fall through chutes to tote boxes at basement level. The boxes are moved by industrial truck to the baling area where a ferris-wheel type turnover fixture dumps them into a baling press. Bales are transferred by conveyor to a gondola outside the plant.

**Press Line Automation:** Automation equipment used in the plant is characterized by mobility, flexibility and simplicity. A considerable degree of standardization and interchangeability of components has been worked out by Ford automation engineers. One feature is the use of two-to-one power drive units, air actuated, on most transfer mechanisms. This type of drive has a short cylinder stroke connected through arms and gearing so that actual movement of the part in process is twice the length of the stroke, doubling the speed of transfer and reducing the required air volume by one half. Extractors for removing stampings from

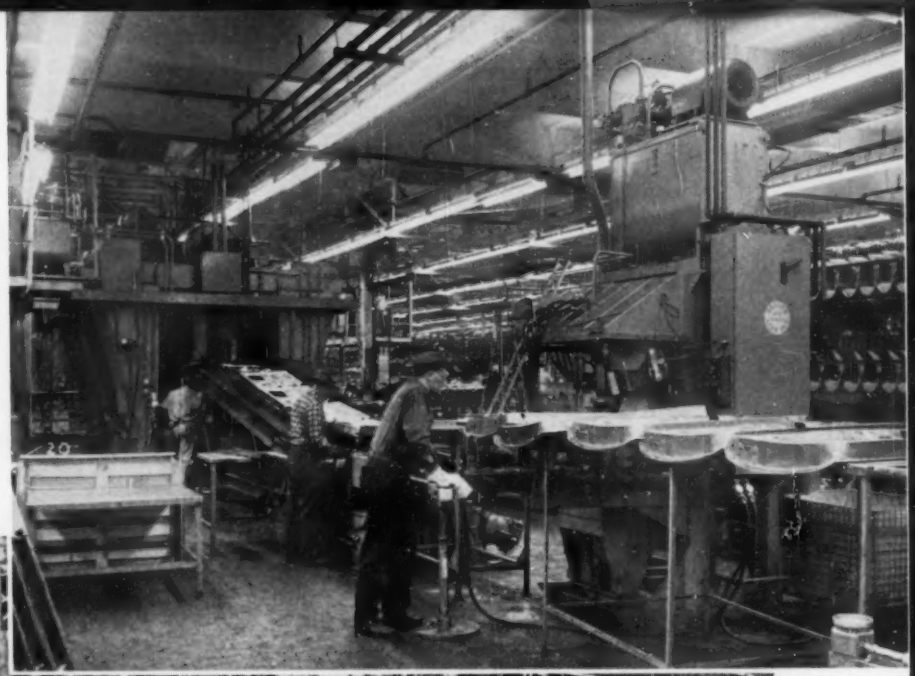


Fig. 4 (right). Continuous flow of parts through welding operations is exemplified by gravity conveyor used to transfer parts from welding press (left) to next welding operation.

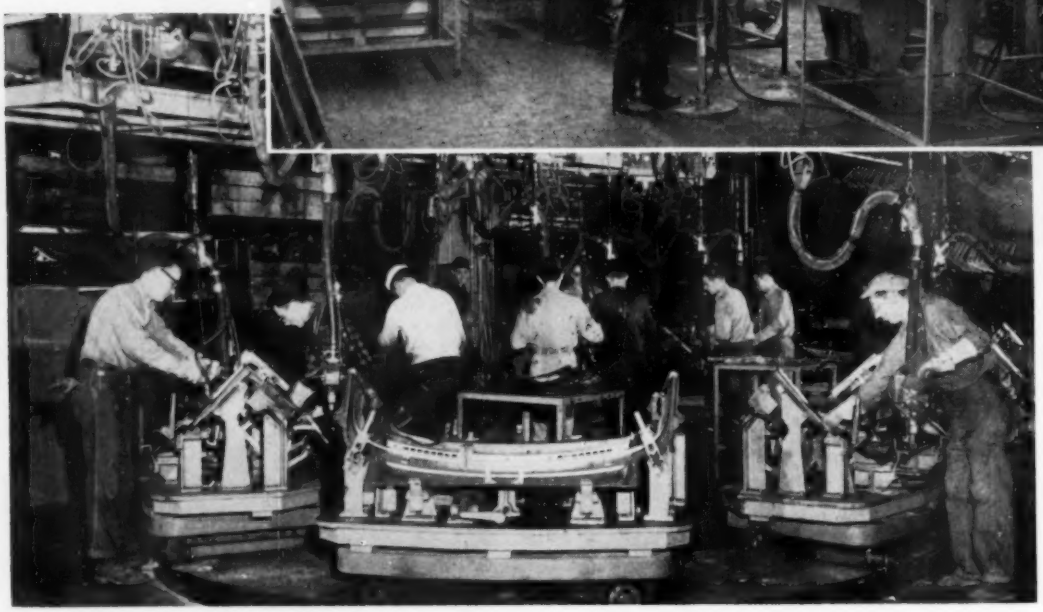


Fig. 5 (below). Merry-go-round conveyor used for assembly and welding of cowl tops. Compact layout conserves valuable floor space.

presses are of the horizontal side-arm type and are synchronized with the press ram, but not attached to the ram as was the case with the original "iron hands." The moving arm and grip jaw are carried on a vertical supporting column, adjustable for different bed heights.

Another Ford-designed innovation is a parallelogram loader or "galloping goose" which, by means of a crank action, lifts a stamping as it leaves one press, moves it forward and then lowers it to the transfer table in approximately 18-inch increments to the next operation, supplementing the former continuous forward motion.

Drop-cam electrical controls, *Fig.* 3, provide the split-second timing required for high-speed automatic press line operation. Limit switches bolted to a slide on the press column are actuated by a cam operating off the ram of the press. Thus the exact sequencing of various operations is obtainend, including lifting or loading pieces into the press, automatic application of drawing compound, scrap removal and conveying the formed part from the press.

**Welding and Assembly Operations:** Press lines and welding operations are linked by large automatic turnover devices. The automatic welding presses used for large assemblies such as doors make a series of spot welds around the edges of inner and outer panels in a few seconds. As the door assemblies emerge from the spot welding press they descend on a gravity conveyor to a second spot welding operation, *Fig.* 4. This continuous conveyorization of parts and assemblies through all production processes contributes importantly to the over all productivity of the plant.

Welding operations on body sides, hoods and cowls are accomplished on merry-go-round conveyors, *Fig.* 5. Parts are held in locking fixtures mounted on wheeled carriages which ride on a

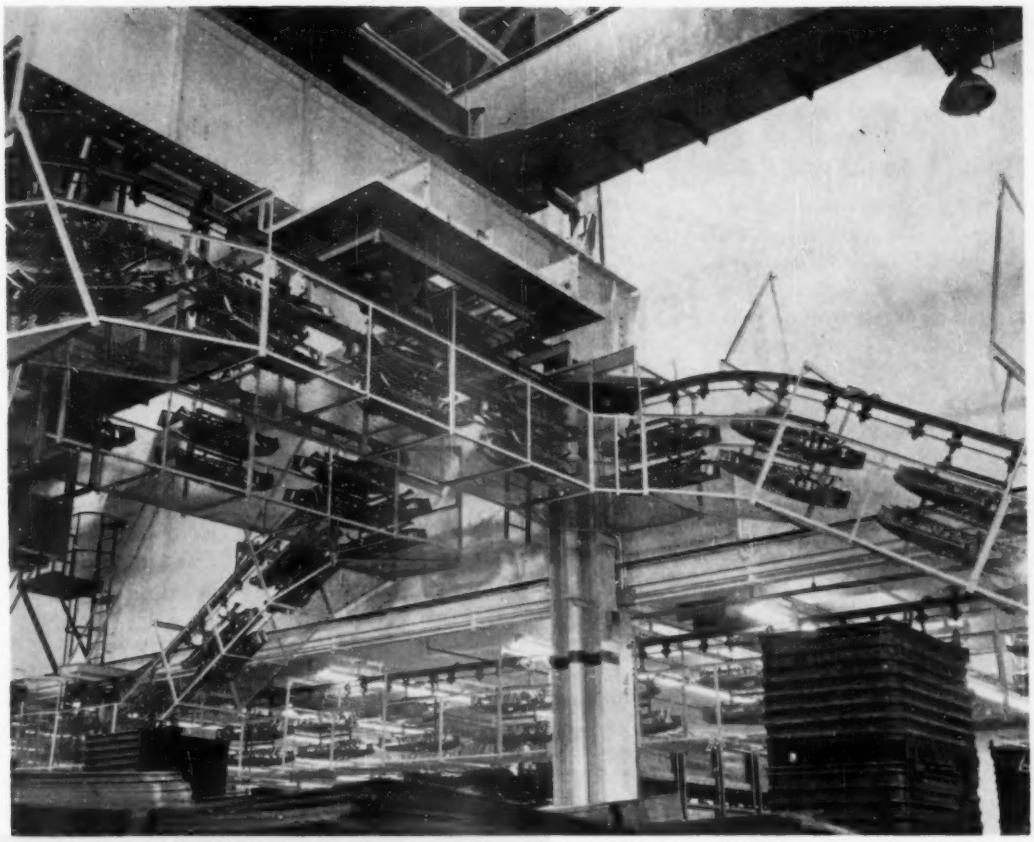


**Fig. 6 (above). Section of overhead monorail conveyor which transports assemblies to the shipping area.**

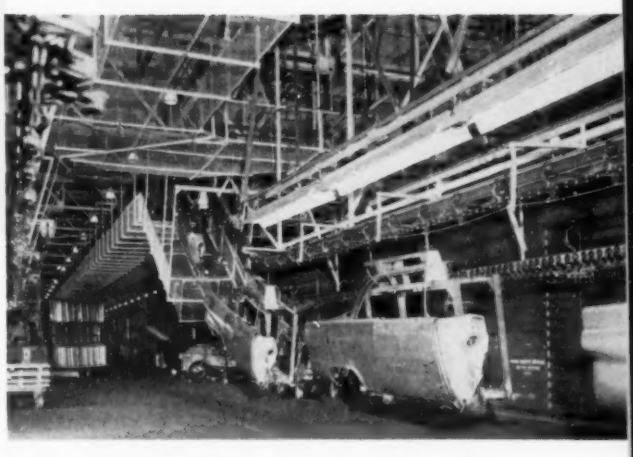


**Fig. 7 (right). Body side assemblies arriving in the shipping dock, ready for shipment to final assembly plants.**

track. Welding guns, which weigh from ten to 40 pounds each, are counterbalanced by overhead spring reels to minimize employee fatigue.

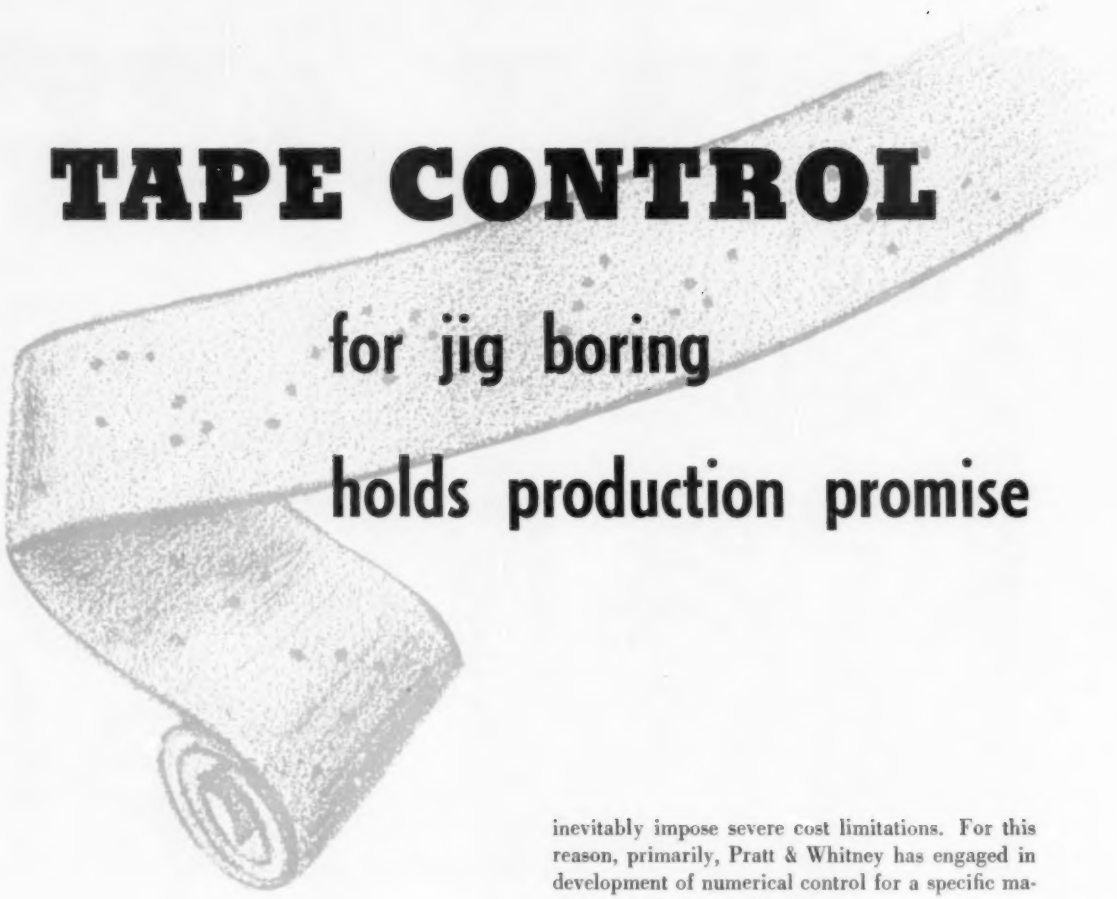
**Shipment:** Completed assemblies are carried to the shipping dock by an extensive overhead conveyor system, *Fig.* 6. The hood conveyor is 2785 feet in length and the body side conveyor covers 2485 feet. Length of the entire conveyor system is over two miles. Industrial tow trucks and trailer fleets, fork lift trucks, and overhead cranes are also used for handling materials at various phases of the operations from steel storage to the shipping dock.

Fifty freight cars can be spotted on the shipping dock, *Fig.* 7. Assemblies are nested in specially designed shipping racks to provide protection in transit and utilize freight car space to the maximum. A float of several days' shipping requirements is maintained in these racks, handy to the dock. Production schedules are geared closely to requirements of Ford, Mercury and Lincoln assembly plants throughout the country. For this reason, schedules on different stampings may vary widely from day to day.

# TAPE CONTROL

## for jig boring

## holds production promise



**By J. J. Jaeger**
**Pratt & Whitney Co., Inc.**
**West Hartford, Conn.**

IDEALLY, A TAPE-CONTROLLED machine tool should be capable of producing any conceivable shape of part. Probably this concept will be utilized only in a few cases where a completely universal characteristic is required. True, a universal control, capable of translating numerical information into any of the variety of slide or tool motions within the mechanical limitations of a machine, would provide a uniform technique which could be utilized on virtually any machine tool. Such a control, however, would require characteristics which would inevitably impose severe cost limitations. For this reason, primarily, Pratt & Whitney has engaged in development of numerical control for a specific machine—the precision jig borer.

**Abstracted from paper 24T12, "Numerically Controlled Jig Borer," presented at the 24th Annual Meeting. Copies of the complete paper are available for purchase from Society headquarters.**

### Adaptability for Numerical Control

Successful application of numerical control depends upon the existence of coordinate axes, whose directions and positions are known, to a higher degree of accuracy than that of the work to be produced. At the same time, the spindle is expected to produce round holes that are straight and perpendicular to the work surface. This invariably is to be accomplished with a tool that rotates eccentrically, with the resulting centrifugal forces placing additional burdens on the machine.

The inherent qualities of the jig borer make it ideally suited for the application of numerical control. Precisely the same demands that are placed on the jig borer are placed on any numerically controlled machine that is to work within similar tolerance limitations. Since numerical controls are set up around a basic coordinate system, whether rectangular or polar, results can never be better than the conformity of the mechanical structure of the machine to the geometry of the coordinate system.

A goal was set of improving and simplifying the operations of such a machine in the toolroom and, at the same time, making available the qualities of a

jig borer to short-run production operations without special tooling.

The heart of a jig borer is its measuring system. A measuring system was available with qualities particularly useful in jig borers. This system, illustrated in *Fig.* 1, consists of a basic measuring bar having one-inch spacings along its length. These spacings are electromagnetically sensed by a head that can indicate its null position electrically. The bar has many qualities which are desirable. It can be built to a high degree of precision in long lengths. Present techniques give bars up to 80 odd inches long with a maximum inch-to-inch accumulated error of less than 50 millionths of an inch. The bar is stabilized steel having the same coefficient of expansion as components of the machine in which it is installed. The machine can readily be designed to accommodate the bar inside its structure to avoid exposure to the dirt chips, abrasives and lubricants. Buried within the machine, it is not subject to rapid temperature changes and responds to ambient variations at the same rate as the machine.

The sensing mechanism operates through an air gap so that there is no wear due to the rubbing or contacting of adjacent surfaces. As a result, it is possible to pass over any lug in either direction without the need of any mechanisms to withdraw the measuring instrument. Since there is no mechanical backlash to be considered, positional errors in either direction can readily be detected. Due to the fact that readings are taken remotely, the bar need not be accessible to the operator and can be placed at its optimum position inside the machine.

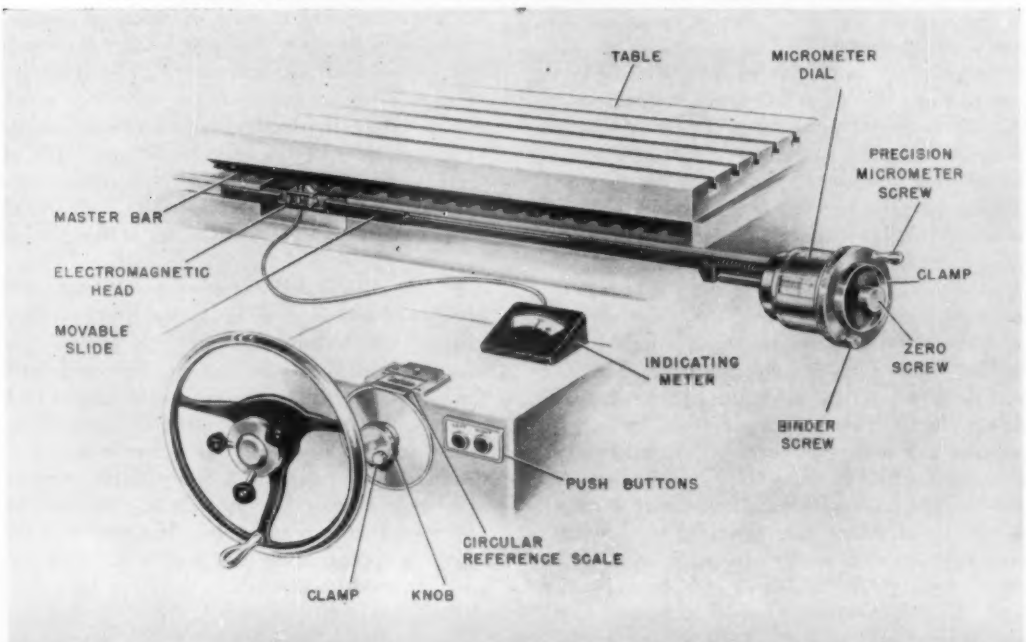
The sensing head is a small electromagnetic device operating through an air gap. It receives virtually no electromagnetic force due to low flux densities. To split each inch into ten thousand parts the head is moved by a precision screw having 1-inch travel. This screw is required to carry only the load of the sensing head and can be made to a high degree of precision. In addition, it is equipped with a corrector bar compensating for the remaining inaccuracy so that positioning of the sensing head can be obtained to an extremely high degree of precision; errors do not exceed 10 millionths of an inch.

Power motion to the table is completely independent of the measuring system. No wear is introduced in the measuring system during its anticipated life. An additional advantage lies in the fact that zero can be arbitrarily established at any position along the table and measurements can be taken either negative or positive, making it possible to dimension drawings from base lines without requiring the operator to establish an arbitrary base line by computation.

## How the Control System Works

While this measuring system is not particularly adaptable as a continuous measuring system, such as might be demanded in some types of numerical

**Fig. 1. Pictorial representation of measuring system for jig borer utilized in tape control.**



control, the system has so many of the qualities required in a jig borer that it was considered desirable to build a numerical system around the measuring bar rather than to try new measuring systems. Furthermore, it is felt no limitation is placed on the jig borer and its numerical control with this type of system. Moreover, a system for a jig borer should be applicable for either linear or angular measurements, since frequently either rectangular or polar coordinates may be used. It has been found possible to utilize this same measuring system on rotary tables for angular measurement.

A block diagram of the system, as finally established, is presented in *Fig.* 2. Information to the machine can be presented either through an operator's keyboard having dials which can be preset to the desired dimensions or through a tape reader which will take its information from holes prepunched in a tape. The information presented to the machine is broken into several groups for the coordinates required.

This digital information is converted into electrical analogs which control the several elements of the system. Thus, on the basis of given information, an analog voltage representing the first three digits of the system is presented to the control to establish an approximate position of the slide. Simultaneously, two analog voltages representing the decimal fraction of the inch to be established on the micrometer drive are presented to position the sensing head precisely to the fractional inch requirement.

**Positioning the Table**

For approximate positioning the slide is handled by conventional techniques since accuracy requirements can be established with readily available components. A slide with its associated feedback potentiometer is driven by power mechanisms so that the voltage obtained from the feedback potentiometer is identical to that established by the input information. Accuracy requirements are nominal; discrimination of one part in a thousand is all that is demanded. Linearity of the system can be on the same order of magnitude. The table program under this particular control would be to approach the point in rapid traverse and, at a preset distance away from the set point, the control would automatically slow down and stop the table. The table will reach a position under this control approximately one tenth of an inch away from its final set position and always in the same direction away from the final set position.

After both micrometer and table have been set to the digital information presented to them, the program controller connects the slide drive to the electric sensing head associated with the measuring bar. The slide continues to move at reduced speed until the null position of the sensing head is established. At this point the slide is clamped and the slide drive is driven in reverse sufficiently to release the strain on all the driving elements that might cause motion in the machine after the position has once been established.

If there are several slides to be positioned, they will all begin to move simultaneously, operating independently of each other. Finally an automatic check of the slide position is made by examining all of the setting units involved, i.e., all the feedback potentiometers and the sensing head, to see if they are all in the balanced condition. If all of these conditions are satisfied, a signal is given to indicate that the operation has been done correctly.

Such a system provides maximum accuracy and reliability. Rather than try to correct a false setting, it is more reliable to indicate that it is false and requires a reset. Any tendency toward introduction of trouble can most readily be detected by such a system.

**Micrometer Drive**

Control of the micrometer drive, although using the same basic principles, is unusual in its design in that high accuracy positioning requirements have been accomplished without the need of high-precision electrical components. The micrometer drive is required to set four significant figures. That means it must be able to establish ten thousand steps, or discreet positions, within its range to be compatible with the accuracy of the system. It must be able to set each of these positions with an accuracy of several parts in a hundred thousand.

Utilizing conventional techniques, these demands are somewhat hard to meet. Accuracy of components would be up to one part in fifty thousand. Linearity of feedback elements would be of similar magnitude. In order to obtain operating speeds that would be satisfactory, high rotational speeds of some of the elements might be demanded. All of these, while theoretically possible, are neither conducive to successful operation nor to long life of components and, in some cases, are practically impossible to achieve.

The four decimal digits are separated into two groups and an analog voltage is established for each of these pairs of numbers. Properly geared, it is relatively easy to take the last two digits and drive the mechanism so that a potentiometer geared to it will establish an angular position corresponding to the required number. This demands only that the discriminator be capable of separating one part in a hundred, since there are only one hundred bits of information to be presented. If linearity of the system is approximately one part in five hundred, adequate precision through its range can be accomplished.

This system is incorporated in the gearing by

means of a precision mechanical differential gear between the drive and the screw, one side of which is driven through an angle corresponding to the last two digits. The other side of the differential gear is arranged to be similarly driven to a position corresponding to the first two digits.

At this point, difficulties would arise if conventional techniques were employed. This drive would be required to discriminate only one part in one hundred as had the other but now its linearity and accuracy of final position must be on the order of one part in fifty thousand. This is not easily accomplished with present-day techniques of electrical control, nor is electrical equipment available with this type of precision.

To solve the problem, the first two digits have only approximate positions established by the electrical setting device. It need set accurately within only five thousandths of its required position. The gearing is established through the differential, so that one revolution of the differential represents ten thousandths of an inch or one digit of the number being positioned.

After the approximate electrical setting has been established, the drive continues its operation until a lock pin falls into a notch on the unit geared for one revolution for ten thousandths of an inch. The mechanical positioning of this lock pin can be established with ease to a much higher order of accuracy than is demanded for the final accuracy.

In the final positioning operation of the slides, the choice was between two general philosophies of control. One might be considered a closed servo system in which the error signal will dictate both the direction and the speed of the final positioning motions. The alternative is also a servo system, but with a predetermined program as to the direction and the speed of the final approach.

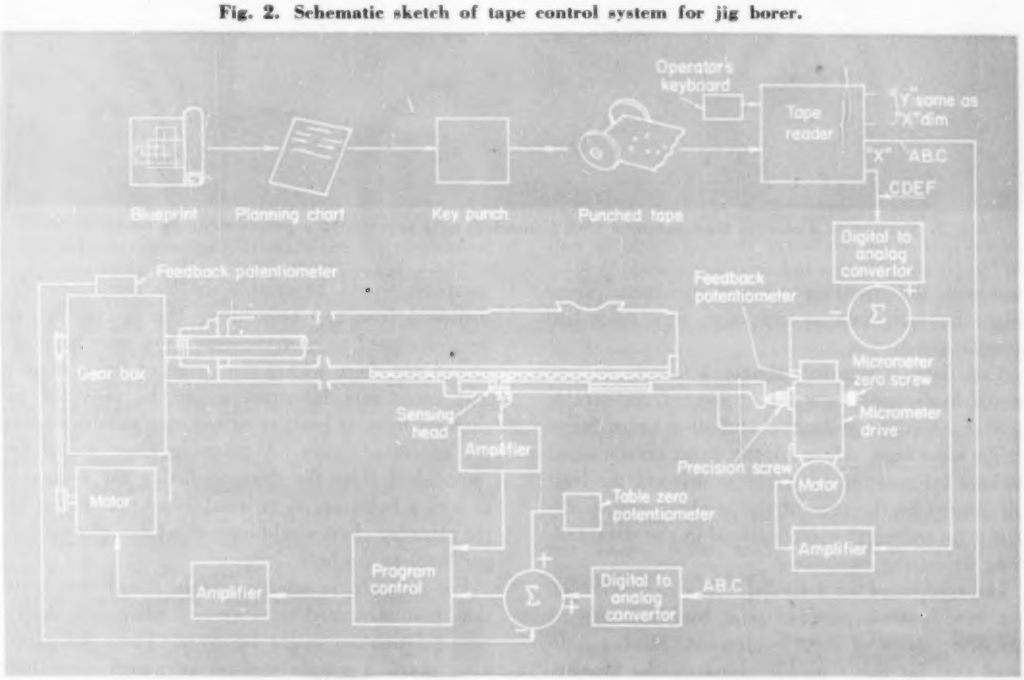
The latter system was chosen for this application because it was thought desirable that machine strains always be taken in the same direction. Experimental work, using both systems of control, led to the conclusion that the fixed program system was more applicable for this type of operation. As a result of the use of this system, the machine always makes its finish approach from the same direction and at the same speed regardless of the direction and distance that were required to bring it to the approximate position.

## Form of Information

In the course of this development, a number of other decisions were required which in no way influenced the internal operation, but are of considerable importance to the user in that they are the sections with which he would be in particular contact. First, an early choice had to be made as to the form in which the numerical data were to be presented to the machine.

Many systems of presenting the numerical data are available to the designer. The straight decimal system is universally used in engineering and accounting. For some classes of data processing

**Fig. 2. Schematic sketch of tape control system for jig borer.**



equipment, it is extremely desirable to use a binary system because it is easier to construct the computing section of the equipment.

For this application, it appeared desirable to stay directly compatible with drawing information and require no translation. Several reasons can be given for this decision. Drawing information prepared for jig borer operation is conventionally established from two base lines for the *X* and *Y* coordinates. No other translation is necessary for insertion in the machine.

This simple system immediately makes it possible to utilize clerical help for the preparation of input information. Use of a straight decimal code also facilitates proofreading of the tape by the keypunch operator or the machine operator. Also, since it might be desirable to utilize this equipment for producing just one part of a kind, it was felt desirable to provide for direct keyboard input.

Use of the decimal code permits the operator to insert drawing information into the machine without making arithmetic code translations. Further extensions of the applications of this machine gave reasons to believe that instructions to machine operators might be prepared on the tape in conjunction with the coordinate setting positions. These might be such data as hole size, feed rates and spindle speeds.

This data, it was felt, should definitely be presented in decimal form and it seemed undesirable to have a mixture of decimal and other coded forms on the same tape. All in all, the direct utilization of decimal information appeared to demand the least adjustment by the user of the machine and it presented no technical complications in the data handling or setting equipment.

The equipment, as designed, can accept information readily from punched tape, punched card or any other forms of input equipment. Studies indicated that for this type of apparatus, the tape-operated system would be the most satisfactory. Sequencing information would be unnecessary and no part number information would be required. Tape is relatively cheap and easy to handle for processing. Corrections can be made easily by splicing, and storage of tape on spools seems to present no problem. Tape appeared to have the additional advantage that, for repeat operations, automatic rewind could be easily provided and the handling of the card deck would be unnecessary between successive jobs.

Several frames of the tape as it is prepared for simple coordinate positioning and hole size information is shown in *Fig.* 3. Positioning information is translated directly by the machine and the hole size is presented to the operator in the display panel so that he can see the decimal form of the hole size that is to be produced.

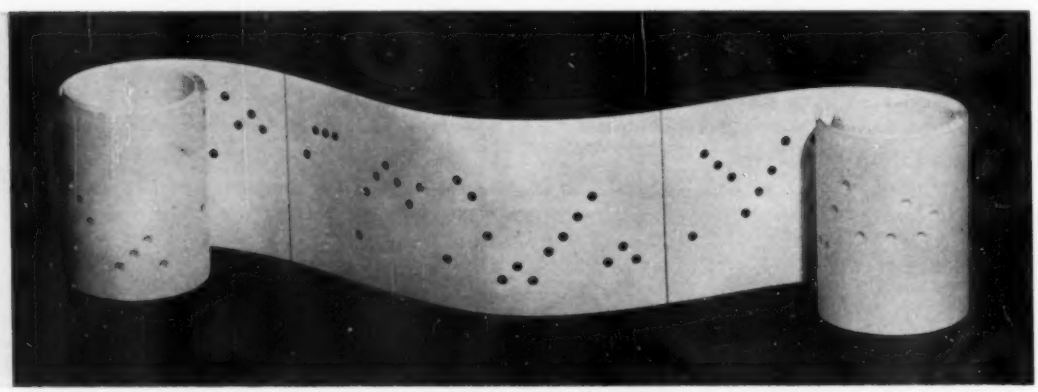


**Fig. 3. Portion of a control tape punched with numerical data representing positions of jig borer table.**

## Programing of Operations

The block diagram, *Fig.* 2, illustrates the general processing that would be required to prepare information for the machine. No change in conventional drafting techniques would be necessary. Hole locations would be established by coordinate dimensions from two base lines. The equipment has been designed so that the base lines may be positioned anywhere within the range of the machine. The coordinate information can be provided in decimal form as positive or negative numbers from the coordinate axes. A planning chart would be established from the drawing listing the sequence in which holes are to be established. Each line of the planning chart would have all of the information pertinent to the hole.

For example, in addition to the coordinate position, hole size, feed rates or any other such desirable information might be given. From the planning chart, a simple manual keypunch operation

would be required to cut a tape. Each block of information representing one operation on the part would be cut in a frame of tape. The tape would be indexed to the next frame and the next bank of information cut. This work can all be done under office conditions where proper planning and proofreading can be accomplished.

The tape reader chosen uses plain tape so that the individual field to be read is located by an index punch. Thus, when tape for relatively simple machines, such as rotary tables, is being prepared the field for each hole location may be quite short. With more complicated machines, longer fields containing more data are required and the index punching will then be at wider intervals. Other mechanical tape index systems would be uneconomical when used with the machines requiring less data.

The tape, along with other pertinent data, would then move to the shop where insertion of the tape into the machine, location of the initial zero for the base line and zeroing of the machine would be accomplished by the operator. From then on the data would be automatically read into the machine. At any time, for purposes of correction or for other unforeseen reasons, the operator could immediately switch from the tape reader to keypunch input so that he could insert any information he chose and cause the machine to be positioned without regard to the tape.

### Versatility of the System

The system is designed to offer great flexibility in its use. A part or tool of which one of a kind is required can be produced as always with drawings presented directly to the shop and the information given to the machine through a keyboard. The advantage is that information is easily translated from the drawing to the machine through the keyboard in direct numerical form without an opportunity for errors in reading of dials or verniers or through mishandling of the machine. Preselection of the next hole can be accomplished while the machine is in operation on a given hole. Tool changing can be undertaken while the machine is automatically moving to its new position. Positioning is rapid and accurate and chances for reading errors are reduced.

Where multiple pieces are required, the changeover is rapid. Only the initial machine zeroing need be accomplished to pick up a new part and any sequence of operations in a control sequence can be achieved without tooling. The data can readily be stored and a repeat lot of the same part can be set up with a minimum of time and paper work. The information to be carried by the tape can be quite varied and matched to a shop's particular needs.

The basic components of the system have been created. Technical limitations are modest. Control variations are limitless. Operations of this general sort can be accomplished with any degree of automaticity that the user may demand. Variations and additions to the control are possible. A device which might find application in shops working on nonferrous materials has been developed. Because relatively few shops can provide constant temperature operations for machines of this sort when machining nonferrous materials, variations in the ambient temperature often require particular care. Since the measurement systems and the machine all have a coefficient of expansion substantially different from that of aluminum or magnesium, a large variation in ambient temperature might cause a manufactured part to vary far from the required dimensions when measured at standard 68 F.

### System Considers Variables

A control system has been designed so that the dimension would be modified as a function of distance, temperature and coefficient of expansion. This can be made to operate automatically so that, for a given material and a given ambient temperature, the dimensions would be automatically expanded or shrunk so that proper results will be obtained when the part is measured.

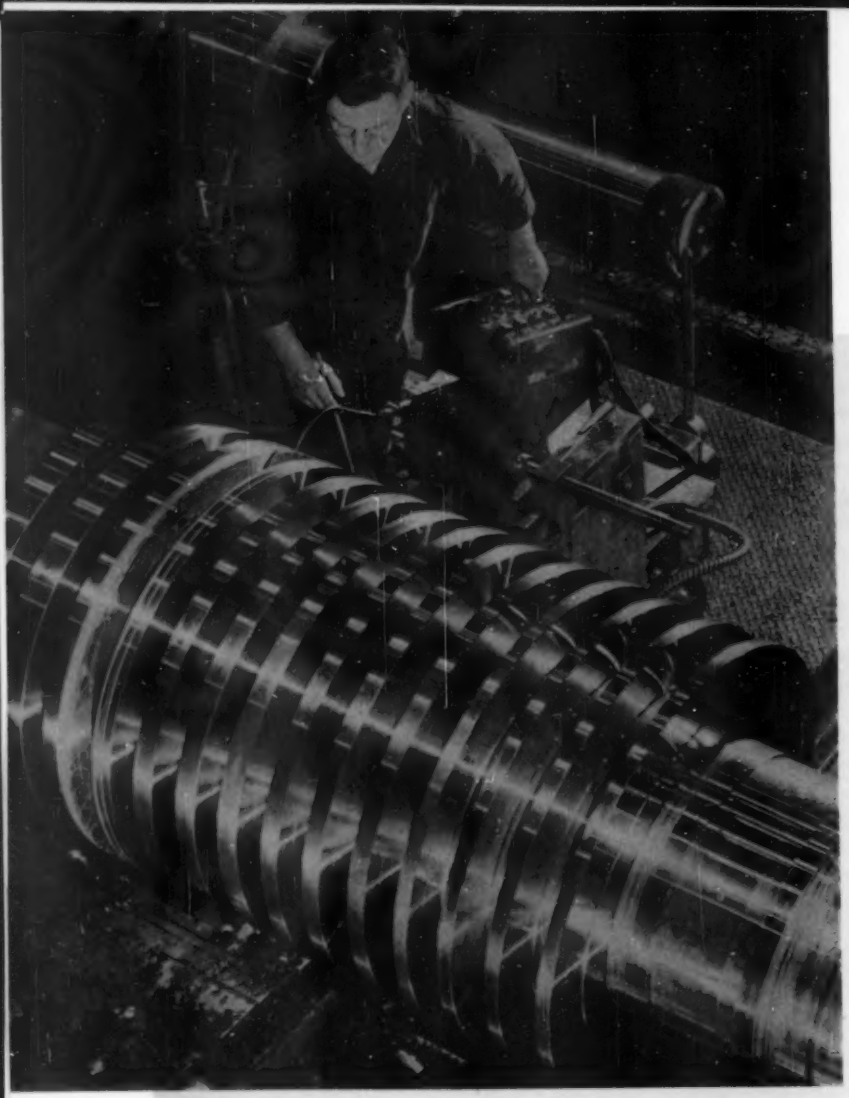
The method is simple and adds little complication to the machine. An analog voltage is produced, which is a function of the first three digits of the dimension, the differential coefficient of expansion and the temperature. This voltage is added to or subtracted from the voltage created to establish the last two digits of the micrometer drive. This will cause the sensing head to move to a position which includes the necessary temperature distance correction for the hole to be produced.

Application of numerical control to the jig borer opens a vast new area of usage for this machine. The combined unit makes possible economic production of short runs of precision parts without the need of elaborate setups and extensive tooling. This machine can fill the need that exists for equipment that can produce parts in production with accuracy limits finer than those accomplished by conventional jigs. The control system has the advantage of making these applications possible without introducing the hazards of an entirely new machine.

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***"The future is the greatest natural asset we have. You make its value, depending upon how you think."***

**Charles F. Kettering**
**Director & Research Consultant**
**General Motors Corp.**



MACHINING a 12½-ton rotor for a steam turbine required a 56 inch by 25 foot lathe. Floor-to-floor time was about 48 hours in General Electric's large steam turbine-generator department plant in Schenectady. Carbide tools are used for the rough cut and high speed tools for finishing. Cutting speed is held constant at 225 sfpm with depths of cuts of 0.022 inch for grooving and 0.018 inch for finishing.

THREAD CHASING operation on zinc, die-cast ignition lock barrels in an indexing machine utilizes mist coolant to avoid subsequent degreasing. Tool life is tripled and maintenance required on previous flood system eliminated, resulting in a total saving of $13,000 annually. The Norgren system incorporates lube rings around the dual chasers and cuts off fog coolant when machine is turned off.

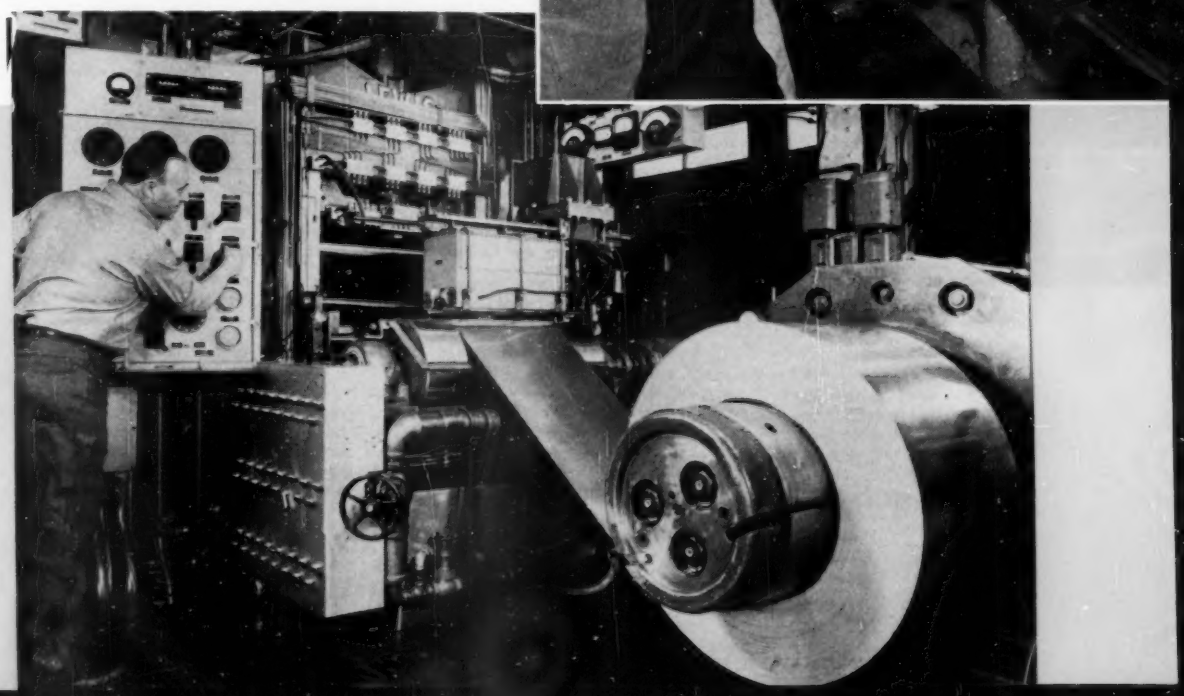


# TOOLS at work

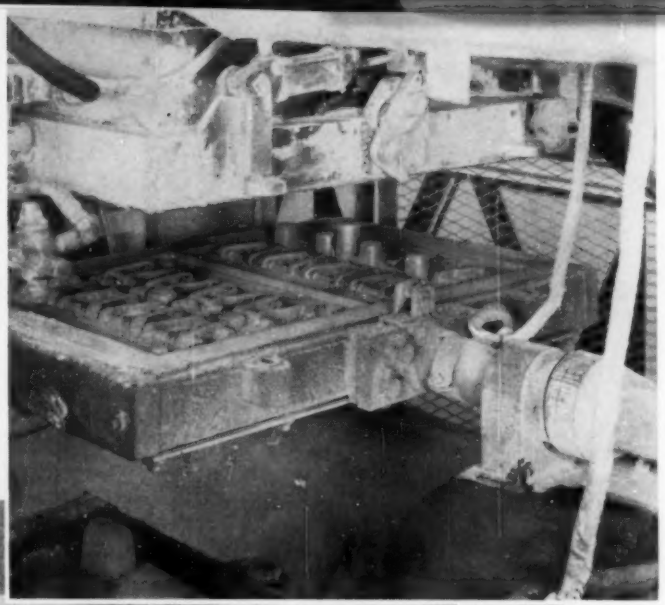


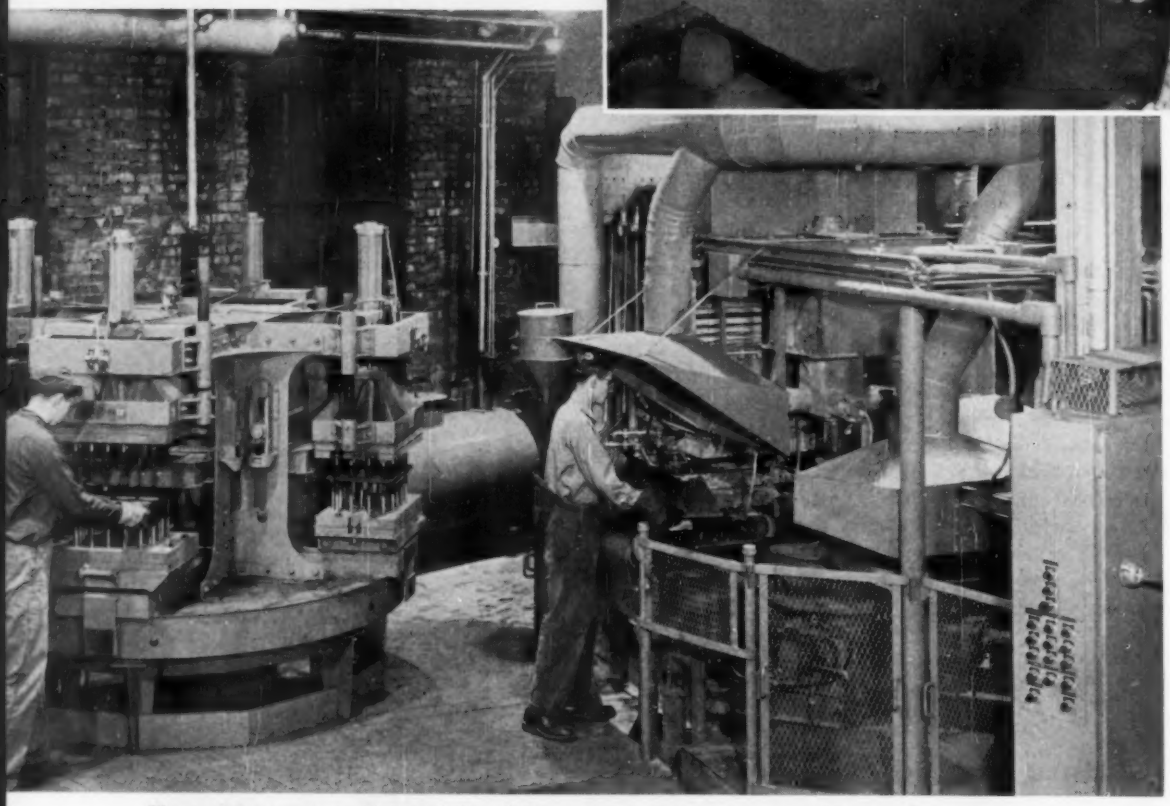
DENSIFYING METAL honeycomb cores for air foils is speeded by special tooling developed by Glenn L. Martin Co. tool engineers. It consists of a work table and clamping device to hold the parts and an adjustable roller which runs along tracks on the side of the table to densify the core to exact specifications. This does the job faster, more accurately and 50 percent cheaper than previous methods.

X-RAY THICKNESS gaging assists in precision control of cold-reducing operation on aluminum alloy strip, finishing from maximum 0.125-inch thickness to 0.010 inch. Gage is located above initial roll. Speeds range from 400 to 1200 fpm in the installation designed and built by Lewis Machinery. Selsyns and solenoid controls are used extensively to minimize operator adjustments.



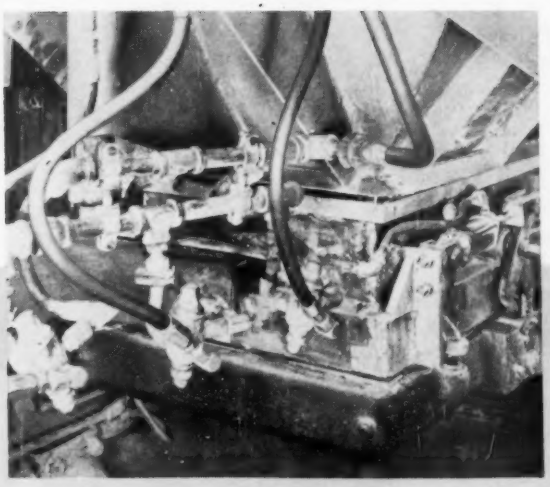
**SHELL MOLDING PROCESS has advanced mechanization of the foundry as illustrated by the installation at the Ewart plant of Link-Belt Co., Indianapolis, depicted on this and succeeding pages.**

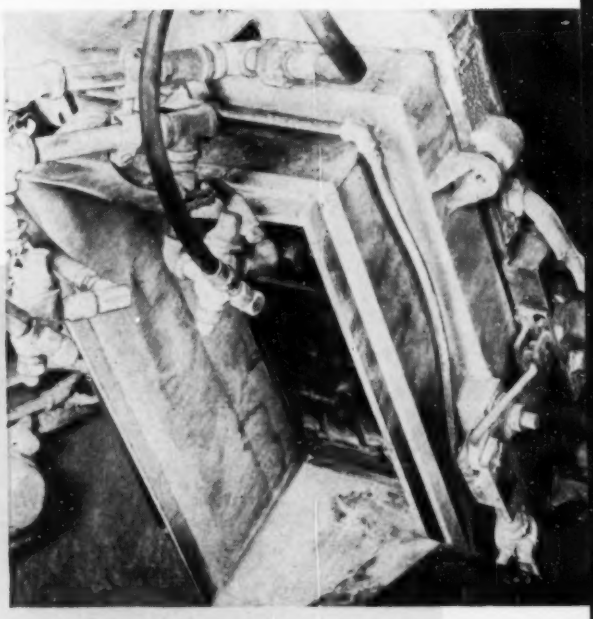




Heart of the compact, efficient shell molding system is the four-station molding machine (right). Four-station shell closing machine is at left. Two men operating the machines can produce up to 240 molds per hour. Sand and resin handling equipment fits behind. (Top) First station of the molding machine forms a shell by dropping or "investing," on a heated metal pattern, a measured volume of mix of thermosetting resin and sand.

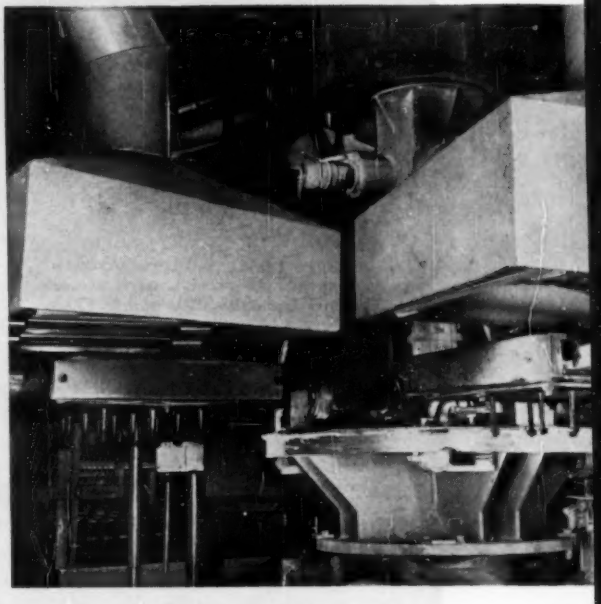
## TOOLS at work





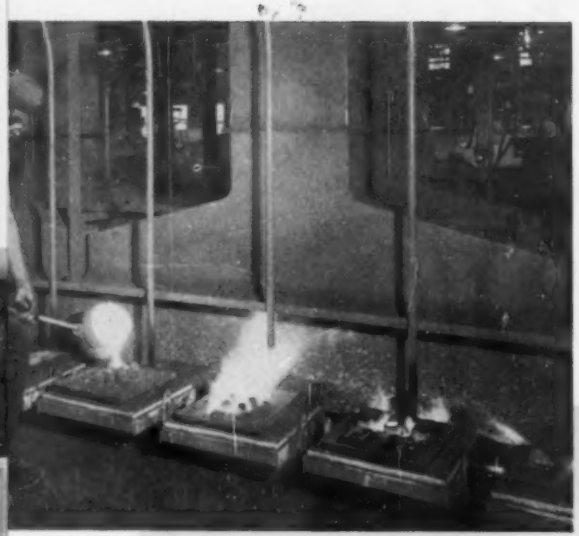
(Above) A water-jacketed flask is lowered over the metal pattern. The flask, in place on the heated pattern, confines the charge of resin and sand. Water cooling prevents build-up of plastic on the inside surface of the flask.

(Upper right) In a succeeding station excess sand mix is removed by roll-over motion, leaving a thin, soft shell on the face of the pattern. Unused sand and resin mix are recycled in the automatic sand handling system, which is an integral part of the installation.



Finished shell is removed from the pattern by operator at the ejector station (first photo opposite page). Parting is facilitated by thin film of release compound which is sprayed on the pattern before start of each investment cycle. Infrared heaters (right) dry out the opened pattern. Drag half of the shell goes to the closing machine for application of adhesive. Cope half, with cores in place, is then positioned on drag. Two halves are held by pneumatic mechanism while adhesive sets.

# TOOLS at work







(Above) Trolley conveyor carries shells to pouring location. Small castings are poured horizontally; normally require no support. This installation also serves to carry shells to storage, when not required by pouring schedule.

(Upper right) Castings produced by means of gated pattern are removed from the shell mold. There are no parting line fins which require grinding. Cores do not shift as they are an integral part of the drag half of the shell.

(Right) Smooth surface and accurate dimension of the small sprockets are typical of shell molded parts. The cored bore is so smooth and concentric that it is threaded directly without premachining.

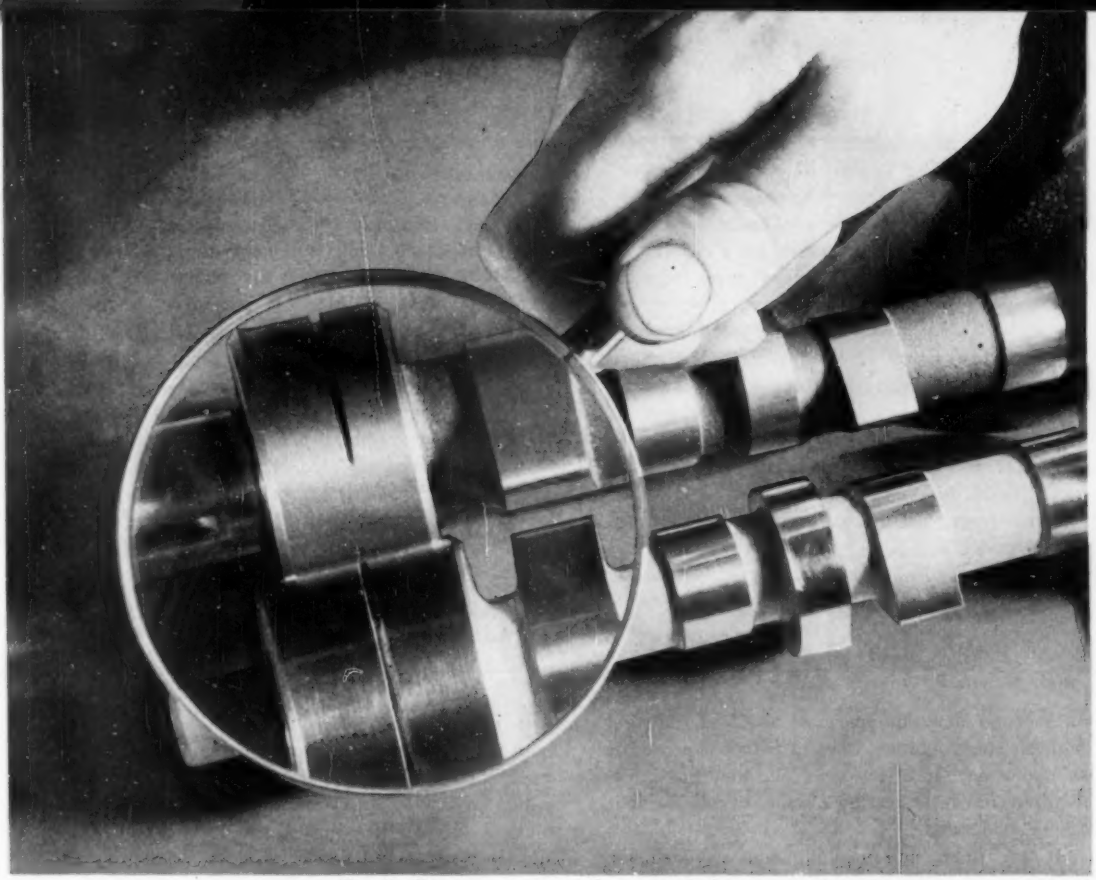


**Fig. 1. For some parts, such as camshafts, "as machined" surfaces are not good enough. For others, additional finishing may be not only expensive but detrimental to function or life.**

# surfaces can be too smooth

**By C. R. Lewis and A. L. Thomson**
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Chrysler Corp.
Detroit, Mich.

SURFACE FINISH IS ONE of the characteristics of a part that the designer should specify in such a way as to mean the same thing to everyone. Although the design engineer specifies all characteristics of a part so it will perform satisfactorily, it is the tool engineer who must transform the specifications into products. Standardization over recent years has improved communication of desired finishes from the designer to the tool engineer but the need for a particular class of finish should still be questioned. Overfinishing can be expensive.

When a process is specified, such as superfinishing, the tool engineer frequently must purchase equipment simply to meet the finish specifications.

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**Abstracted from paper 24T33, "Surface Finish and the Production Engineer," presented at the 24th ASTE Annual Meeting. Copies of the complete paper are available for purchase from Society headquarters.**

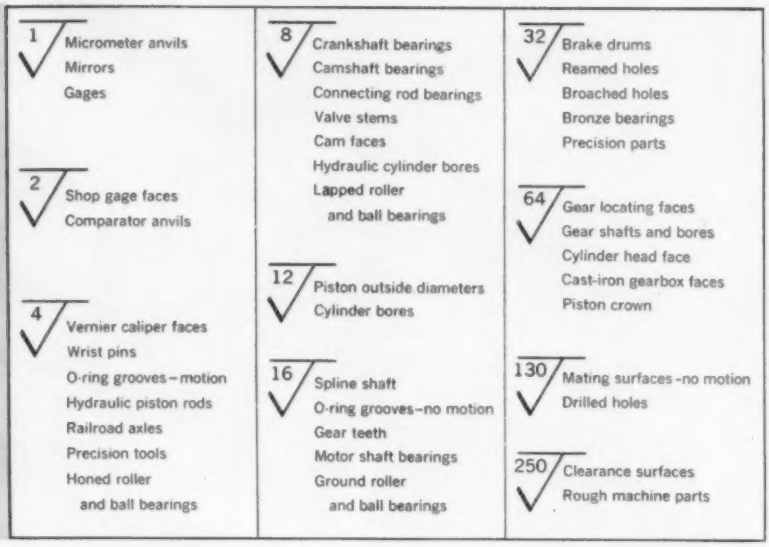



**Fig. 2. Typical values of surface finish for specific types of parts.**

As soon as new equipment is acquired, the tool engineer starts figuring ways to reduce expenses of its operation. It often turns out that the finish requirement can be met by a standard process or it can be moderated.

At one time, superfinishing was specified for automotive piston skirts, brake drums, cam surfaces, and tappet barrels and heads. Specification of these surface finishes grew from study on effects of various surface roughnesses. This work dramatized the increased performance possible with smoother surfaces. Finishes were specified, in microinches, rms, as: 5 to 25 for piston skirts, 4 to 6 for brake drums, 3 to 12 for cam contours, and 2 to 4 for tappet barrels and heads.

Consequences came soon: production parts are not used in the laboratory; they perform under service conditions. Production parts have to wear in to their mates and fine surfaces take longer. Break-in should be a time of high wear to provide true mating between parts that work together. The break-in period for fine surfaces was sometimes longer than the time allowed, with the result that pistons, tappets and cams sometimes scuffed. When a rougher surface is allowed, high initial wear provides mating surfaces with adequate smoothness for stable operation. Where initial fit is correct, rough surfaces do not provide as wear-free operation as smooth ones but this disadvantage is outweighed by the small chance of failure in use. Now, piston skirts are left in the turned condition with roughness up to 60 microinches, rms. Cans are ground to 20 and tappets to 12 microinches, rms. Tappets are phosphate coated for additional protection during break-in.

Character of a surface is often vital, whether it is left ragged or ends up as a succession of plateaus with depressions between. If mating surfaces are both of the plateau type, good bearing area results. Such surfaces provide for local wear, heat dissipation and wear debris accumulation. This leads to long service life. Superfinishing provides this surface condition but, under production conditions, often does not provide true mating contours on two parts.

Most machining operations leave a jagged profile but, since sharp points are either knocked off or form grooves during the break-in period, the net result is surfaces of the desired kind. In practical manufacturing, ideal surfaces are often not desirable. This proved to be the case with the automotive parts named.

Experience has shown that brake drums quickly wear to a roughness of 15 to 20 microinches, rms, whether they begin smooth or rough. Superfinishing, originally specified to produce good initial lining contact, proved advantageous for such a short time that it was discontinued. Boring to size is now the final operation on brake drums. To prevent excessive initial lining wear, drum roughness is held to a maximum of 120 microinches, rms.

Another example is found with cylinder bores where smooth surfaces prevented proper piston ring wear-in. Former values for roughness of 12 preferred to 16 maximum have been raised to 20 and 35 microinches, rms, with the advent of chrome-plated piston rings. Initial wear is mainly on the bores instead of the rings. Because honing can be an automatic operation, it is still used for finishing.

Honing is also used to finish main and connecting rod bores. Although these are not running surfaces—they support bearing inserts and transfer heat—their surface condition is important. If the bore is too rough, it does not properly support the

bearing material, allowing minute flexing and resulting in fatigue failure. Smooth bores can increase heat transfer because more area is in contact. A maximum roughness of 60 microinches, rms, has been found acceptable for heat transfer and to prevent bearing fatigue.

A few years ago, piston pins carried a specification of 1 to 2 microinches, rms. Such finishes are costly. Experience subsequently showed that this severe limitation could be relaxed without sacrificing performance. Today, piston pins are finish lapped to a maximum of 6 microinches, rms.

It is interesting to note that to name an operation does not specify surface roughness. All common machining operations result in ranges of roughness. Specification of an acceptable roughness range is usually a safer rule for critical surfaces. Crank main and connecting rod journals are exceptions to the last statement. This is true because babbitted bearings have the best service life when running against the type of surface formed by superfinishing, i.e., a surface substantially free from sharp asperities.

Jagged points slice through the thin bearing layer to the hard backing material. This results in formation of migratory wear particles, leading to frequent failures. Superfinishing to a roughness not exceeding 15 microinches, rms, has proved the best method for these critical surfaces. Camshaft bearings, *Fig.* 1, which run against babbitt bearing inserts, give better performance when superfinished.

A different criterion determines acceptable roughness for sliding surfaces of pushbutton gear shifting slides. These slides are punched from strip stock, the final step being in a shaving die. The pieces have sliding surface roughness as high as 150 microinches, rms. Rough slides operate satisfactorily but do not give the impression of quality the car owner expects. This difficulty has been met by tumbling the slides before plating. The roughness has been reduced to 32 microinches, rms, and operation is acceptable.

During early production of parts with a specified surface finish, inspectors closely check surface finish. After process bugs have been corrected, it is usually possible to check finish by appearance and by dimensional inspection. Air gages used for dimension inspection will usually indicate when a surface deviates far from its specification. In fact one gage maker is using the air-leakage principle specifically for checking surface finish. Based on statistical samples, surface finish should be thoroughy checked at various times during production runs.

Experience is important in achieving surface finish control in manufacturing. Based on experience, tool engineers have been able to meet new specifications with established operations. Also, they have integrated surface finish control into automatic production. Because human error is avoided in automatic operations, control of finish is more positive and less inspection is required.

Experience also plays an important part in initial specification of surface finish. Deesigners rely on their own and the published, *Fig.* 2, experience of others. There are times, however, when parts of novel design are submitted to laboratory test to establish correct roughness limits. In addition, laboratories continually study the interrelationships between surface finish, load, friction, velocity, material and lubrication.

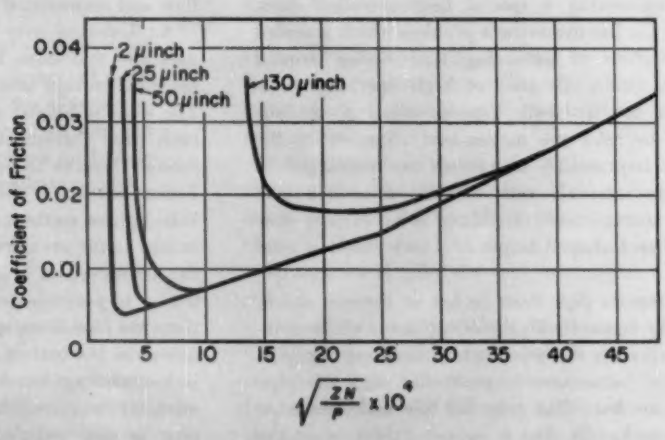



**Fig. 3. Effects of speed (*N*), viscosity (*Z*), surface finish and load (*P*) on friction as derived from laboratory experiments. Curves are for various finishes expressed in microinches. The viscosity is a function of temperature and the type of lubricant.**

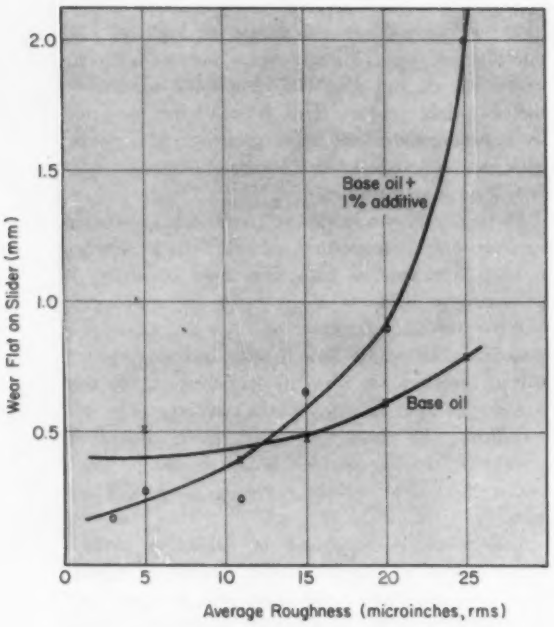



**Fig. 4. An additive in the oil is an aid to smooth surfaces but increases wear on rough surfaces in a specific test.**

Careful laboratory experiments, where the factor of fit can be disregarded, have shown that smooth surfaces break in faster and with less initial wear than rough ones. This does not contradict earlier statements that surfaces can be too smooth where mating surface fits are important. The effect of surface roughness on the friction between two flat, lubricated sliding surfaces is shown in *Fig.* 3. For these curves, the independent variable is a relation between speed and viscosity (numerator) and load (denominator). Larger loads are toward the left with small scalar values. Considering constant speed and temperature, several times as high a load can be carried by a 2-microinch surface as by one of 130 microinches, and with less friction loss.

Type of lubricant used on sliding surfaces during break-in can influence wear. Results of a test in which the sample areas were small and the unit loadings were high are shown in *Fig.* 4. It is interesting to note that a lubricant additive was beneficial for smooth surfaces but increased the wear on rough surfaces.

There is no universal method of specifying or obtaining the best surface finish for a given application. For wearing parts, the purpose of a finish specification is to achieve correct operating fit in the shortest time and with the least wear. Proper finish for this purpose depends not only on materials but on such design factors as operating deflections and on such manufacturing factors as tolerance and uniformity. The tool engineer should be able to specify a suitable manufacturing process to meet any given surface finish requirement. More importantly, his tooling should produce surfaces of low dimensional tolerances and high uniformity so the better performance of smooth surfaces can be used to improve product quality. Economy of surface production is important and, obviously, it is uneconomical to produce quality beyond the point of utility.

## *Controlling Pipe Temperature for Molten Lead Transfer Work*

By engineering a special heat-controlled oven, Okonite Co. has overcome a problem which attended the operation of extruding lead casing around electrical cable. Because of high operating pressures in the hydraulic presses used, continuous feeding to refill the molten-lead chamber of the press is impractical, so presses are recharged at 30-minute intervals with 900 lb of molten lead from a storage tank. Refilling is by gravity flow through an L-shaped length of 3-inch stainless steel pipe.

The transfer pipe must be hot or thermal shock, caused by contact with the 600 F lead, will eventually deteriorate the pipe metal. Cradling the pipe could not be accurately controlled and the pipe became too hot. Not only did this make the pipe difficult to handle, but it caused oxidation of the molten lead as it passed through the pipe. Oxidized lead accumulated in the pipe. This both restricted flow and necessitated frequent cleaning.

An L-shaped over now houses the pipe between uses and maintains it at 300 F. The pipe is connected to storage tank just prior to each recharging. The oven is hinged along its longitudinal axis for each pipe placement. Heat is supplied by three tubular heaters in series spaced uniformly inside bottom section of the oven. A controller and 220-volt 3-phase contactor are mounted on a panel attached to the oven frame, so that oven and controls can be moved as a unit. Sensing bulb of the controller is positioned under the surface which supports the pipe for greatest accuracy. The lid section, as well as the bottom and sides of the lower section, is insulated against heat losses. The heaters themselves are not insulated; therefore, heat flow to the pipe is not retarded and excessive heat is not trapped near the heaters which would decrease their service life.

# machine accounting cuts maintenance costs

By T. W. Black
Assistant Editor

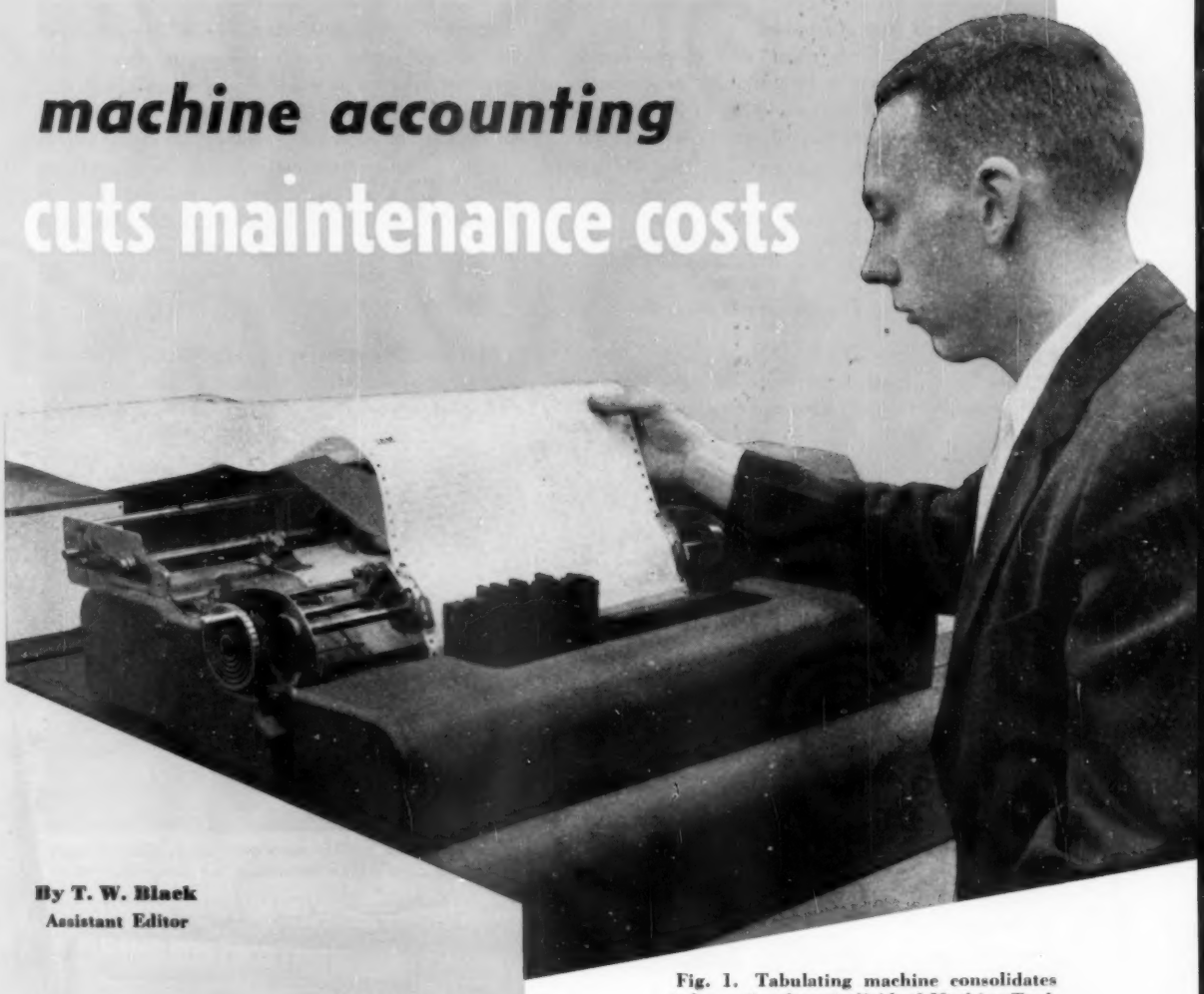


Fig. 1. Tabulating machine consolidates information from individual Machine Tool Repair Cards and Die Maintenance Cards.

**Success of programs for the control of maintenance costs is dependent on the adequacy of data presented to management. This data can be processed by machine accounting methods to minimize clerical effort and facilitate review.**

SUCCESS OF PROGRAMS for the control of maintenance costs is dependent upon the accuracy and extent of information submitted to management. In large plants the amount of clerical effort necessary to consolidate maintenance information into a form which can be readily reviewed and interpreted can become excessive. This problem has been solved at the Poughkeepsie, N. Y. plant of IBM through the use of machine accounting equipment, *Fig.* 1, to tabulate die maintenance and machine tool repair data.

Recording of pertinent information starts in the maintenance department, where the key documents in the program, the Die Maintenance Card and Machine Tool Repair Card, *Fig.* 2, are originated. A separate card is filled out for each repair.

**Die Maintenance:** When a die is received in the shop, the departmental clerk records the time received on the Die Maintenance Card. Other information placed on the card includes the time the repair is started, tool number, part number, number of the production department rejecting the die, date, number of parts run since previous repair,

type of die and type of trouble.

Die troubles are classified into eleven major groups. Each of these is identified by a code number in order to facilitate processing of information on the tabulating machine. Classifications used for coding are:

| | |
|---|---|
| Resurface | Incorrect setup |
| Part not to dimension | Stripper trouble |
| Add carbide | Pulls slugs |
| Chipped | Add knockout pins |
| Broken punch or dieblock | Design improvement. |
| Clearance | |

After each repair is accomplished the time of completion, total repair time and total out-of-service time are recorded on the card, *Fig.* 3. The employee who did the repair work writes any necessary comments on the card at this time and also signs it.

Running records, *Fig.* 4, are kept of the repairs on each die to facilitate review by die repair supervision. These records are valuable for identifying recurrent troubles on individual dies and serve as a guide in ordering replacement parts. Details of previous work done on the die, such as the amount ground off in sharpening a punch, are often useful to the repairman.

**Machine Maintenance:** The Machine Tool Repair Card is similar to the Die Maintenance Card and information is recorded in a similar fashion.




**Fig. 2. Machine Tool Repair and Die Maintenance Cards. Basic information needed by management to evaluate and control maintenance costs is recorded on these cards by personnel in the die room or machine tool repair shop.**

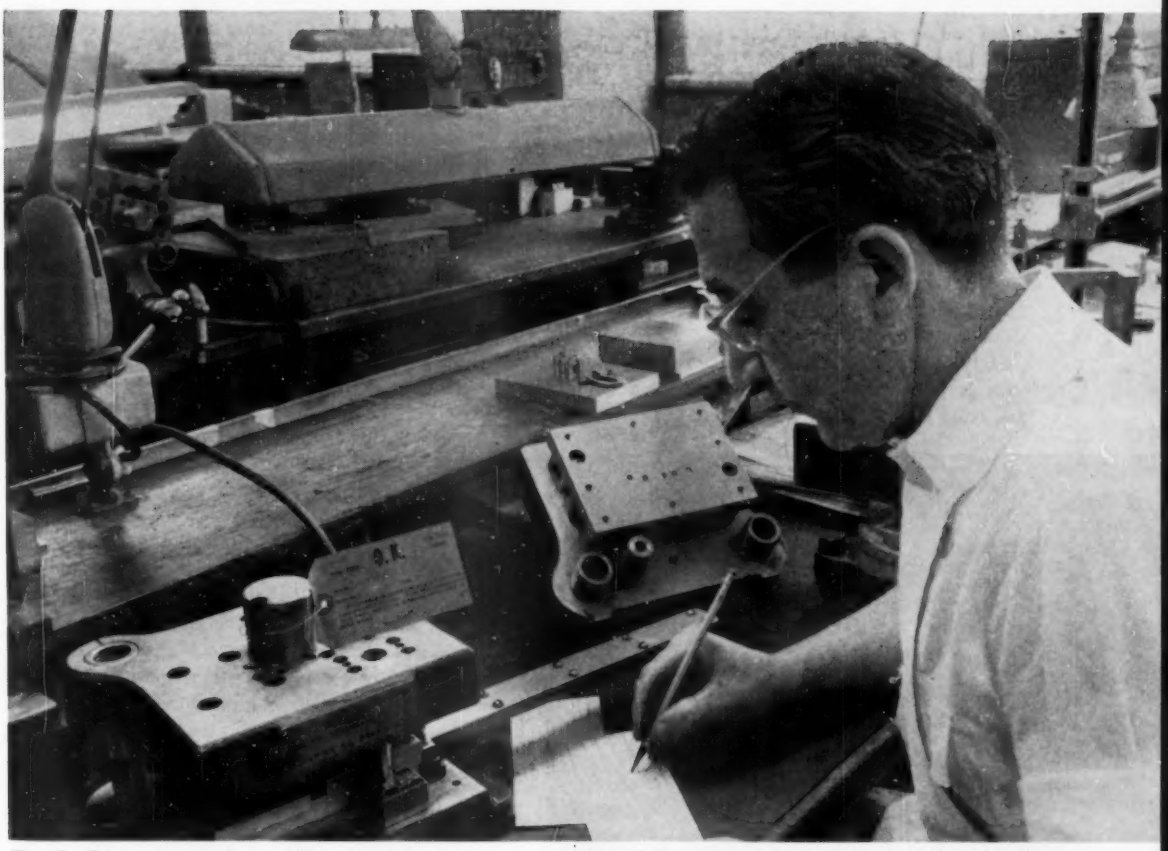


Fig. 3. Die room employee filling out information as to time spent and nature of repair on a die. Other pertinent information such as time received, tool and part numbers, is recorded by departmental clerk.

| Tool # 5VV858-B | Kind of die | Machine group # 660 BLISS 2247 | Recommended speed 5000/HR | Tool inspector man # 76018 | Tool # 5VV858-B |
|---|---|---|---|---|---|
| Part # 1071 3/4 | PIERCE & BLANK | | | | Date 3-1-54 |

| Date | No. of part produced | Description of trouble | Amt gr'd from Die | Amt gr'd from Punch | Service time hrs. | Toolmaker man # | Remarks: .040 X 2" STOCK C-1035 C.R.S. R.B. 90-105 |
|---|---|---|---|---|---|---|---|
| 3-2-54 | 10,000 | BURR ON .094 HOLE | .005 | .004 | 4.5 | 76564 | TO .098 SHARPENED - INCREASED BUSHING I.D. |
| 3-4-54 | 19,500 | SHARPEN | .004 | .003 | 1 | 78642 | SHARPEN |
| 4-1-54 | 40,500 | SHARPEN | .005 | .003 | 1 | 78642 | SHARPEN |
| 4-30-54 | 500 | BROKEN PUNCH SHEARED DIE | .008 | .000 | 3.5 | 07102 | NEW .094 PUNCH - SHARPEN DIE |
| 5-1-54 | 39,000 | SHARPEN | .005 | .004 | 1.5 | 78642 | — |
| 6-3-54 | 55,000 | SHARPEN | .006 | .005 | 1.5 | 78642 | SHARPEN |
| 6-6-54 | 0 | INCORRECT FEED - DIE SHEARED | .009 | .003 | 16.5 | .08110 | MADE NEW NOTCH PUNCH & .094 PUNCH — SHARPENED |
| 6-9-54 | 30,000 | O.K. | | | | | |
| 7-4-54 | 40,000 | PULLS SLUGS SHARPEN | .005 | .004 | 21.0 | 7656W | MADE NEW ¼ BUSHINGS SHARPENED |
| 7-29-54 | 60,000 | SHARPEN | .004 | .003 | 1.5 | 78642 | S |
| 7-30-54 | 20,000 | OK | | | | | |
| 8-30-54 | 40,000 | BURR ON .345 DIA — SHARPEN | .005 | | | | |
| 9-17-54 | 40,000 | OK | | | | | |

Fig. 4. (left) Running record of repairs, maintained for individual dies, facilitate evaluation of recurrent repair problems.

Nine coding classifications for machine tool repairs have been established:

| | |
|---|---|
| Install | Replace |
| Repair | Safety |
| Clean or lubricate | Inspection |
| Check or adjust | Instruction. |
| Rebuild | |

After conversion to punched card form, *Fig.* 5, information on the cards is processed in a tabulating machine which prints the periodic Machine Tool and Die Maintenance Reports.

A typical page from a Machine Maintenance Report is shown as *Fig.* 6. The brass tag number, location, date, number of repairs, lost production hours and number of hours required for repair can be quickly determined for any given machine.



**Maintenance Meetings:** Information on the reports is reviewed at meetings attended by representatives of tool engineering, manufacturing, tool services and equipment maintenance, and equipment procurement activities. At these meetings, necessary action is agreed upon. Availability of maintenance information in concise form has been an important factor in the success of these meetings.

Besides highlighting trouble areas, the reports serve other important purposes. In order to determine what conditions are abnormal, for instance, it is necessary to know what conditions can be regarded as normal. Comparisons between maintenance records of similar or identical tools or machines make it possible to define normal wear on a die or normal repairs on a machine tool.

The wide range of historical information available on the reports aids the die designer and personnel responsible for the procurement of equipment. Another use is in determining the relative economics of rebuilding a machine tool versus purchase of a new one. Often the comparative downtime figures of new and rebuilt machines furnish the answer.

**Fig. 5. Key punch machine is used to convert all written information on Machine Tool Repair and Die Maintenance Cards to punched card form for processing in the tabulating machine.**

**Fig. 6. (below) Machine Maintenance Report makes it possible to locate problem areas at a glance and is the source of much useful comparative information on maintenance conditions.**

Ownership
1- Government
2- IBM

Repairs on Production Machines

February 21, 1958

| Service Code | Brass Tag No. | Mach. Group | Dept. | Bldg. | Date Reported | Date Completed | Repaired By | Ownership | Lost Production | Repair Time | Material Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 783 | 3 | 12755 | 12755 | 63713 | 2 | 80 | 80 | |
| | | | 783 | 3 | 12755 | 12755 | 68708 | 2 | 80 | 80 | |
| | | | | | | | | | 160* | 160* | * |
| 0 | 1606 | 504 | 42 | 4 | 12555 | 12555 | 72864 | 1 | 13 | 13 | |
| | | | | | | | | | 13* | 13* | * |
| 0 | 79106 | 1928 | 175 | 80 | 12455 | 12455 | 63713 | 2 | 53 | 46 | |
| | | | | | | | | | 53* | 46* | * |
| 0 | 98155 | 805 | 31 | 2 | 11955 | 11955 | 63713 | 2 | 31 | 24 | |
| | | | | | | | | | 31* | 24* | * |
| 0 | 98173 | 805 | 83 | 1 | 12155 | 12155 | 71468 | 2 | 10 | 10 | |
| | | | | | | | | | 10* | 10* | * |
| 0 | 98542 | 3412 | 97 | 1 | 10655 | | 67852 | 2 | 11 | 11 | |
| 0 | 98542 | 3412 | 97 | 1 | 10656 | | 67852 | 2 | 8 | 8 | |
| | | | | | | | | | 19* | 19* | * |
| 0 | 98905 | 1000 | 256 | 4 | 12855 | 12855 | 64954 | 2 | 20 | 20 | |
| | | | | | | | | | 20* | 20* | * |
| 0 | 124250 | 1902 | 63 | 2 | 12155 | 12155 | 65322 | 2 | 23 | 23 | |
| 0 | 124250 | 1902 | 63 | 2 | 12155 | 12155 | 63713 | 2 | 23 | 23 | |
| | | | | | | | | | 46* | 46* | * |
| 0 | 145680 | 825 | 283 | 4 | 12455 | | 66214 | 2 | 80 | 80 | |
| 0 | 145682 | 825 | 283 | 4 | 12555 | | 66214 | 2 | 80 | 80 | |
| 0 | 145680 | 825 | 283 | 4 | 12655 | | 66214 | 2 | 80 | 80 | |
| 0 | 145682 | 825 | 283 | 4 | 12755 | | 66214 | 2 | 80 | 80 | |
| | | | | | | | | | 320* | 320* | * |
| 0 | 167168 | | 782 | 3 | 11755 | 11755 | 67776 | 2 | 80 | 80 | |
| | | | | | | | | | 80* | 80* | * |
| 0 | 190024 | 802 | 31 | 2 | 11955 | 11955 | 63713 | 2 | 22 | 22 | |
| 0 | 190024 | 802 | 31 | 2 | 11155 | | 63713 | 2 | 71 | 64 | |
| | | | | | | | | | 93* | 86* | * |
| 0 | 192734 | | 390 | 2 | 11955 | 11955 | 72864 | 2 | 26 | 26 | |
| | | | | | | | | | 26* | 26* | * |
| 0 | 403635 | 1382 | 71 | 2 | 12455 | | 67776 | 2 | 60 | 53 | |
| 0 | 403635 | 1382 | 71 | 2 | 12555 | | 67776 | 2 | 7 | 7 | |
| | | | | | | | | | 67* | 60* | * |

# thread chasing speeds

EFFICIENCY IN THREADING operations is dependent, to a large degree, on the use of correct surface speeds for the type of material being threaded and the number of threads per inch in the workpiece. Recommended surface speeds for chasing threads with HSS die heads are given in TABLE 1. These speeds can be converted to rpm by using TABLE 2.

Even when correct threading speeds are used threading troubles may occur. The following check list suggests the necessary corrective action for many of these troubles.

**Shaving:** This condition is characterized by thin threads and by threads with sharp crests. Possible causes are:

1. Misalignment of die head and work
2. Worn or damaged chasers
3. Worn slots in the holder, allowing chasers to tilt when threading
4. Turret being forced ahead or being allowed to drag when threading
5. Incorrectly ground chasers.

**Rough Threads:** Incorrect speeds can cause rough or poor threads. Other possibilities are:

1. Incorrect face grind or improper chamfer of tool for material being threaded
2. Use of improper lubricant during grinding.

**Stripped or Torn Threads:** Conditions causing rough threads can also cause stripped or torn threads. In addition, check:

1. Chasers to see if they are in alignment
2. Alignment of die head and work.

**Tapered Threads:** Thread taper is usually detected when the Go gage travels only part way and then stops or when a check with pitch micrometers shows a variation in diameter at the pitch line. The trouble may be caused by shaving. Other conditions to look for are:

1. Dull chasers
2. Misalignment of die head and work
3. Insufficient bearing area between chaser and workpiece.

**Chattered, Out-of-Round or Drunken Threads:** These troubles are usually caused by improper chaser grinding. Typical grinding faults are:

1. Face thickness of chaser ground too far undersize
2. Chasers in same set ground to different depth and angle
3. Incorrect face grind for material being threaded.

**Poor Thread Form:** These troubles are similar to those listed under shaving, and the same remedial measures should be applied.

**Table 1—Threading Speeds***

| Material | Surface Speeds (fpm) | | |
|---|---|---|---|
| | 3½ - 7½ tpi | 8 - 11 tpi | 12 - 32 tpi |
| Tool steel | 5 | 8 | 10 |
| Nickel, Chrome-nickel, Chromium and Chrome-vanadium steels; Monel metal; Forgings | 10 | 15 | 20 |
| Screw stocks; Tobin bronze; Drawn steel; Machine steel | 20 | 30 | 50 |
| Cast iron; Malleable iron | 25 | 50 | 80 |
| Copper; Phosphor bronze | 40 | 80 | 150 |
| Cast brass; Bar brass; Rubber; Fiber; Aluminum; Zinc | 50 | 100 | 200 |

*For all taper threads produced by jam cut use 75% of speed given.

**Lead Error:** Troubles from lead error are usually caused by:

1. Shaving (See shaving troubles)
2. Forcing turret faster than natural lead of thread
3. Allowing turret to drag
4. Improper threading speed
5. Misalignment of die head and work
6. Improper face and chamfer.

**Chaser Breakage:** Frequent causes of chaser breakage are:

1. Die head running into shoulders or fillets
2. Using oversize stock
3. Misalignment of die head and work
4. Taking too heavy a cut
5. Hard spots in the stock
6. Heavy burr on stock
7. Keyways, holes or other indentations in stock.

Many threading problems are caused by incorrect grinding of the cutting tools. Correct chaser face grinding procedures will be the subject of a future reference sheet.

**Table 2—Conversion of Surface Speed to rpm**

| | Surface Speed (fpm) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 8 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 80 | 100 | 150 | 200 |
| Diam of Work (inches) | Rotational Speed (rpm) | | | | | | | | | | | | |
| ⅛ | 152 | 245 | 305 | 458 | 611 | 764 | 917 | 1222 | 1528 | 2445 | 3056 | 4584 | 6112 |
| ¼ | 76.5 | 122 | 153 | 229 | 306 | 382 | 458 | 611 | 764 | 1222 | 1528 | 2292 | 3056 |
| ⅜ | 51.0 | 81.4 | 102 | 153 | 204 | 255 | 306 | 407 | 509 | 815 | 1019 | 1528 | 2038 |
| ½ | 38.2 | 61.2 | 76.5 | 115 | 153 | 191 | 229 | 306 | 382 | 611 | 764 | 1146 | 1528 |
| ⅝ | 30.5 | 48.8 | 61.0 | 91.7 | 122 | 153 | 183 | 244 | 306 | 489 | 611 | 917 | 1222 |
| ¾ | 25.5 | 40.8 | 51.0 | 76.4 | 102 | 127 | 153 | 204 | 255 | 407 | 509 | 764 | 1018 |
| ⅞ | 21.8 | 35.0 | 43.6 | 65.5 | 87.3 | 109 | 131 | 175 | 218 | 349 | 437 | 655 | 874 |
| 1 | 19.1 | 30.6 | 38.2 | 57.3 | 76.4 | 95.5 | 115 | 153 | 191 | 306 | 382 | 573 | 764 |
| 1⅛ | 16.9 | 27.2 | 33.9 | 50.9 | 67.9 | 84.9 | 102 | 136 | 170 | 272 | 340 | 509 | 680 |
| 1¼ | 15.2 | 24.4 | 30.5 | 45.8 | 61.1 | 76.4 | 91.7 | 122 | 153 | 244 | 306 | 458 | 612 |
| 1⅜ | 13.9 | 22.2 | 27.8 | 41.7 | 55.6 | 69.5 | 83.3 | 111 | 139 | 222 | 278 | 417 | 556 |
| 1½ | 12.7 | 20.4 | 25.4 | 38.2 | 50.9 | 63.7 | 76.4 | 102 | 127 | 204 | 255 | 382 | 510 |
| 1⅝ | 11.7 | 18.8 | 23.5 | 35.3 | 47.0 | 58.8 | 70.5 | 94.0 | 118 | 188 | 235 | 353 | 470 |
| 1¾ | 10.9 | 17.4 | 21.8 | 32.7 | 43.7 | 54.6 | 65.5 | 87.3 | 109 | 175 | 218 | 327 | 436 |
| 1⅞ | 10.1 | 16.3 | 20.3 | 30.6 | 40.7 | 50.9 | 61.1 | 81.5 | 102 | 163 | 204 | 306 | 408 |
| 2 | 9.5 | 15.3 | 19.1 | 28.7 | 38.2 | 47.7 | 57.3 | 76.4 | 95.5 | 153 | 191 | 287 | 382 |
| 2⅛ | 9.0 | 14.4 | 18.0 | 27.0 | 36.0 | 45.0 | 54.0 | 72.0 | 90.0 | 144 | 180 | 270 | 360 |
| 2¼ | 8.5 | 13.6 | 17.0 | 25.5 | 34.0 | 42.4 | 50.9 | 67.9 | 84.9 | 136 | 170 | 255 | 340 |
| 2⅜ | 8.0 | 12.9 | 16.1 | 24.1 | 32.2 | 40.3 | 48.3 | 64.4 | 80.5 | 129 | 161 | 242 | 322 |
| 2½ | 7.6 | 12.2 | 15.3 | 22.9 | 30.6 | 38.2 | 45.8 | 61.1 | 76.4 | 122 | 153 | 229 | 306 |
| 2⅝ | 7.2 | 11.6 | 14.5 | 21.7 | 29.0 | 36.3 | 43.5 | 58.0 | 72.5 | 116 | 145 | 218 | 290 |
| 2¾ | 6.9 | 11.1 | 13.9 | 20.8 | 27.8 | 34.7 | 41.7 | 55.6 | 69.5 | 111 | 139 | 208 | 278 |
| 2⅞ | 6.6 | 10.5 | 13.2 | 19.8 | 26.4 | 33.0 | 39.6 | 52.8 | 66.0 | 106 | 132 | 198 | 264 |
| 3 | 6.3 | 10.1 | 12.7 | 19.1 | 25.5 | 31.8 | 38.2 | 50.9 | 63.7 | 102 | 127 | 191 | 254 |
| 3⅛ | 6.1 | 9.7 | 12.2 | 18.3 | 24.4 | 30.5 | 36.6 | 48.8 | 61.0 | 97.6 | 122 | 183 | 244 |
| 3¼ | 5.8 | 9.4 | 11.7 | 17.6 | 23.5 | 29.4 | 35.3 | 47.0 | 58.8 | 94.0 | 118 | 176 | 236 |
| 3⅜ | 5.6 | 9.0 | 11.3 | 16.9 | 22.6 | 28.3 | 33.9 | 45.2 | 56.5 | 90.4 | 113 | 170 | 226 |
| 3½ | 5.4 | 8.5 | 10.9 | 16.4 | 21.8 | 27.3 | 32.7 | 43.7 | 54.6 | 87.3 | 109 | 164 | 218 |
| 3⅝ | 5.2 | 8.4 | 10.5 | 15.7 | 21.0 | 26.3 | 31.5 | 42.0 | 52.5 | 84.0 | 105 | 158 | 210 |
| 3¾ | 5.1 | 8.1 | 10.2 | 15.3 | 20.4 | 25.5 | 30.6 | 40.7 | 50.9 | 81.5 | 102 | 153 | 204 |
| 3⅞ | 4.9 | 7.9 | 9.8 | 14.8 | 19.7 | 24.6 | 29.6 | 39.4 | 49.3 | 78.8 | 98.5 | 148 | 197 |
| 4 | 4.7 | 7.6 | 9.5 | 14.3 | 19.1 | 23.9 | 28.7 | 38.2 | 47.7 | 76.4 | 95.5 | 143 | 191 |




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Dinner Speaker C. E. Schooley, second from left, assistant chief engineer for American Telephone and Telegraph Co., demonstrates the use of transistors in communications. In the front row are, from left: Prof. H. F. Owen, conference co-chairman; Mrs. O. D. Lascoe, ladies' program chairman; C. Chapman; National President H. C. McMillen; Mrs. E. Peterson; and Neil Bietler. In the back row are: Jerry Krumpelman; John C. McMillen, President McMillen's son and newly elected chairman of the Purdue student chapter; and H. Verne Loeppert, chairman of the National Program Committee.

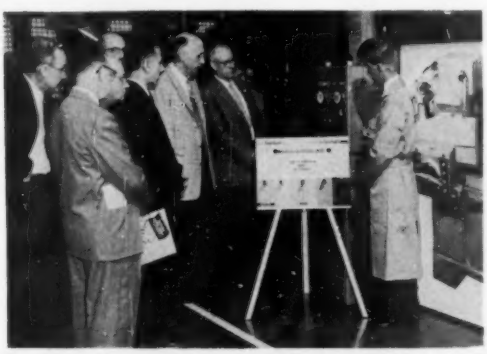
# Purdue Host to Tool Engineers

More than 300 tool engineers and their wives attended Purdue University's fourth annual on-campus conference on April 28. Tooling demonstrations in the school laboratories, panel discussions on ceramics and on automation, and a dinner meeting were among the day's events.

National Homes Corp. conducted the wives through some newly built homes for a view of trends in interior decoration. Orville D. Lascoe, professor of industrial engineering at Purdue and a member of the ASTE National Education Committee was chairman of the conference.



Attending the luncheon meeting were: President McMillen; Past President Osborn; John Hicks, assistant to the president of Purdue; Leslie Fletcher, ASTE research director; Harold Housewerth; Marv Bunting, ASTE staff administrator; and H. T. Armine, head, department of Industrial Engineering, Purdue.



A tooling demonstration is given by George Gow of Heald Machine Co. on the company's feedback instrument showing its place in unitized automation.

Ceramics panelists were, from left: Ted Harding, chairman; R. F. Hook, chief metallurgist, The Warner & Swasey Co.; H. Jack Siekmann, engineer in charge of the Carboloy Machinability Laboratory; George Barnes, sales engineer, Norton Co.; and W. B. Kennedy, chief, experimental machining branch, Watertown Arsenal.



# State University of Iowa On-Campus Conference



This audience at the morning session in Shambaugh Lecture Room heard talks entitled "A Builder of Universal Machine Tools Looks at Automation," "When Is an Automated Machine Tool Practical," and "Controlled Handling of Parts in Process."

"Automation for Small Industry" was the theme of the second annual on-campus college-industry conference held at the State University of Iowa on April 21. It was sponsored by ASTE and Iowa's department of mechanical engineering in cooperation with the Industrial Engineering Association of Iowa, Quad City Association of Industrial Engineers, the Mississippi Valley chapter of American Institute of Industrial Engineers, the Cedar Rapids chapter of ASM, and the student chapter of the ASME.



Comparing notes are Kenneth J. Trigger and Leslie R. Gouak. Prof. Trigger of the department of mechanical engineering, University of Illinois, is a member of the National ASTE Education Committee. Mr. Gouak is chairman of the Cedar Rapids chapter.



A demonstration in the art of weaving was enjoyed by wives who attended the conference. The program was staged by the home economics department.



Table talk is exchanged by Howard C. McMillen, national president of ASTE, and Dr. E. F. Lindquist, professor of education and director of the Iowa testing program. President McMillen spoke at the luncheon and Dr. Lindquist talked on "Automation in Educational Measurements."

# Seven Chapters Meet at Worcester



Above is the head table of the Regional Conference held April 30 at Worcester, Massachusetts. It was sponsored by Central New England Council, composed of Springfield, Little Rhody, Worcester, Boston, Merrimack Valley and Northern and Southeastern Massachusetts chapters. More than 350 tool engineers from these and neighboring chapters attended the all-day meeting, which was climaxed by an address on "Promises of the Peaceful Atom" by G. R. Molesworth, president of Molesworth Associates, New York.



Talking over the dinner agenda are, from left: Toastmaster V. H. Ericson, former national vice president; Host Chapter Chairman L. P. Tarasov, National Editorial Committee member; Speaker G. R. Molesworth; President H. C. McMillen; Past President R. F. Waindle, who presided at the morning session; National Treasurer J. X. Ryneska; and Past President R. H. Morris.



About to board bus for Wyman-Gordon Co. to see mammoth 50,000-ton press are President McMillen and other visitors. At the morning program E. V. Crane, chief of development engineering at E. W. Bliss Co., spoke on "Cold Extrusion of Steels," laying the foundation for talk on "Tools for Heavy Forging Presses" by A. H. Swift and J. W. Owen of Wyman-Gordon. At lunch G. W. Motherwell, vice president of engineering development, traced the history of heavy die forging presses.



Host Committee chairmen and members who were responsible for smooth-running conference are, from left around table: Daniel W. Hoyt, public relations chairman; Andrew B. Anderson; Alden U. Maynard; E. Roland Ljundquist, arrangements chairman; Ralph A. Baker; Arthur Lawler, Jr.; John Raymond; Carroll L. Morse, reservations chairman; and John C. Lalor. Missing is Program Chairman Adam T. Kosciusko.

# Serving on your national committees . . .

Helping to guide the activities of the various national committees during the year 1956-57 will be more than 150 national committee members, giving freely of their time and efforts to further the aims of the Society.

The still-expanding **National Book Committee** will again be led by Francis J. Sehn, assisted by two vice chairmen, Willis J. Potthoff of St. Louis and David A. Schrom of Central Pennsylvania. Other members are W. F. Ardussi of Cleveland; John S. Brozek of New Haven; Frank W. Curtis; George H. DeGroat and Robert W. Ford of Detroit; William H. Gourlie of Hartford; Prof. R. S. Green; Richard D. Gross of Philadelphia; O. E. Koehler of Northern Massachusetts; J. Rudolph Miller of Detroit; R. C. Montanus of Springfield, Ohio; Waldemar Naujoks of Syracuse; Leland K. Pruett of Detroit; Edward A. Reed of Saginaw Valley; Dr. G. A. Roberts of Pittsburgh; George H. Sanborn of Detroit; Dr. A. O. Schmidt of Milwaukee; Norman F. Snyder of Saginaw Valley; Richard T. Thornton of Detroit; Ralph L. Vanderslice of Lansing; Ralph A. Wagner of Nashville; Raymond H. Meckley of Central Pennsylvania; Fred G. Sachleben of St. Louis; George C. Adams of Los Angeles; Earl K. Wheat of Mohawk Valley; and Vice President George A. Goodwin, ex officio.

Vincent M. Spahr will again head the **National Constitution and Bylaws Committee,** with Arthur Cervenka of Long Island as vice chairman, Irving F. Holland of Hartford as parliamentarian, Mel Burdett of Louis Joliet and Roy O. White of Wichita. Vice President H. Dale Long is an ex officio member. Marvin J. Bunting serves as staff administrator.

New Chairman G. Ben Berlien of the **National Editorial Committee** will be helped by Donald E. Wernz of Baltimore as vice chairman; Harold Hagle of Erie; Joseph L. Petz of Mid-Hudson; Harold Sullivan of Twin Cities; Leo P. Tarasov of Worcester; Donald Zierk of Fox River Valley; and, as ex efficio member, Vice President Goodwin. John W. Greve, editor of THE TOOL ENGINEER, is their staff liaison.

Continuing as chairman of the **National Education Committee** will be Prof. Robert E. McKee, whose committee will include: Carl J. Oxford, Jr. of Detroit, vice chairman; Prof. Myron L. Begeman of Houston; Dr. Lawrence H. Cook of Santa Clara Valley; Edwin L. Cutler of San Gabriel Valley; Prof. Von Roy Daugherty of Calumet Area; Prof. Arthur F. Gould of Lehigh Valley; O. S. Hulley of Schenectady; Prof. Charles C. Lasater of Knoxville-Oak Ridge; Prof. Orville D. Lascoe of Indianapolis; Charles W. Moody of Boston; Richard B. Niebusch of Cincinnati; Prof. Frederick Preator of Salt Lake City; Prof. Kenneth J. Trigger of Chicago; Vice President Wayne Ewing, ex officio; and Richard J. Bacik, staff administrator.

Assisting **National Finance Committee** Chairman Frank J. Hausfeld, Jr. will be Duane Brighton of Peoria as vice chairman; Robert J. Pioch of Jackson; Andrew Cirbus of Cleveland; Bruce Fairgrieve of Toronto; National Treasurer John X. Ryneska; President Howard C. McMillen, ex officio; and Office Manager Charles H. Prince as staff assistant.

James R. Weaver will chairman the **National Honor Awards Committee,** which is made up of ASTE past national presidents. His vice chairman will be Frank W. Curtis of Detroit, while other members are A. H. d'Arcambal of Hartford; Cletus V. Briner of Cleveland; Douglas D. Burnside of Nashville; Ray H. Morris of Hartford; W. B. Peirce of Pittsburgh; Albert M. Sargent of Detroit; and Otto W. Winter of Buffalo-Niagara, assisted by Technical Director Frank W. Wilson.

Also made up of Society past presidents is the **National Judicial Committee,** of which T. Bert Carpenter is chairman. He is assisted by A. H. d'Arcambal; Douglas D. Burnside; Frank W. Curtis; Ray H. Morris; Frank A. Shuler and Walter F. Wagner of Detroit; James R. Weaver; and Otto W. Winter.

In charge of the **National Membership Committee** for the second year will be H. Verne Loeppert, whose vice chairmen are Emanuel E. Lull of Syracuse and Sam Grasso of Nebraska. His area captains will be: Ralph Chrissie of Los Angeles; Carl A. Darger of Muncie; Frank A. Flannery of Akron; Gordon Hall of Hamilton; E. P. Huchzermeier of St. Louis; Floyd J. McArthur of Twin States; James A. McCollum of Ann Arbor Area; Robert W. Miller of Cincinnati; Orville B. Strahm of Wichita and John L. Webster of Monmouth. Appointed area lieutenants are: Allan Ashley of Benton Harbor-St. Joseph; Richard Fitzgibbons of Mid-Hudson; Jimmie Franklin of North Texas; James W. Hindman, Jr. of Houston; Carl Hoffman of Syracuse; Robert M. Johnson of Twin Cities; S. A. Mathews of Saginaw Valley; Clayton S. Parsons of Hartford; H. Wilson Ryno of Northern New Jersey; John H. Somers of Southeastern Massachusetts; John M. Speck of Des Moines; and Carl Zehr of Ashtabula County. Vice President Harold E. Collins sits with them as ex officio member and Marvin J. Bunting as staff administrator.

Newly appointed chairman of the **National Professional Engineering Committee** is Vernon H. Gallichotte, who will carry out its plans with the aid of: Hugo L. Aglietti of Long Island and Howard W. Gross of Philadelphia as vice chairmen; L. E. Doyle of Chicago; A. R. Fairchild of Piedmont; James Felter of Albuquerque; George Julien of Twin States; John Lengbridge of Toronto; Leslie C. Seager of Salt Lake City; C. M. Smillie of Detroit; and Charles H. Thuman of Evansville. Vice President Ewing is ex officio member and George M. Hargreaves acts as staff administrator.

**National Program Committee's** new chairman, Edmund Hollingsworth, has Harry A. Paine of Chicago and Karl G. Nowak of Boston as his vice chairmen. Also members are John J. August of Erie; Francis E. Bowers of Louis Joliet; Paul Brainard of Houston; George H. Churchill of Hamilton; James V. Coulter of Golden Gate; Morton Blum of Cedar Rapids; Henry E. Kuryla of Hartford; James R. Matthew of Tucson; Richard A. Miller of Dayton; Lawrence D. Pomerantz of Long Beach; Gerald K. Sick of Rochester; Edward Wiard of Detroit; Vice President Collins, ex officio; and Richard J. Bacik, staff administrator.

Immediate Past President Harry B. Osborn, Jr., who by virtue of being president last year is chairman of the **National Progress Committee,** will have as members: President McMillen; Vice President Long; National Secretary William Moreland; Joseph P. Crosby of Boston; Vincent M. Spahr of Lima; Ben J. Hazewinkel of Los Angeles; Ray H. Morris of Hartford; and Executive Secretary Harry E. Conrad.

Wilfred B. Wells, chairman of the **National Public Relations Committee,** will be assisted by Harry J. Todd of Salt Lake City and George C. Bennett of Long Island as vice chairmen; Glen H. Stimson of Northern Massachusetts as chairman of the movie subcommittee; Clifford P. Farr of Toronto; Robert L. Gay of Hartford; Keith Griffin of San Fernando Valley; John A. Sheridan of Schenectady; Vice President Collins, ex officio; and Richard Gebers, Public Relations Manager, staff member.

The **National Research Fund Committee,** whose members are appointed permanently, is headed by Robert B. Douglas of Montreal, with James R. Weaver as vice chairman. Working with them are: Kenneth R. Beardslee of Detroit; Wallace E. Carroll of Chicago; Dwillard J. Davis of Detroit; William E. Mahin of Canton; Dr. Daniel J. Martin of Houston; Louis Polk of Dayton; Joseph Sunnen of St. Louis; and G. W. Trichel of Detroit. ASTE Executive Secretary Harry E. Conrad and Col. Leslie S. Fletcher, ASTE research director, provide staff assistance.

After his appointment as chairman of the **National Standards Committee,** John E. Rotchford named Arthur E. Crom as vice chairman, and will also be assisted by: George F. Bryan of Pontiac; Truman Coy of Greater Lancaster; Clyde L. Fanning of Saginaw Valley; F. J. Geoffroy of Denver; Louis Jensen of London-St. Thomas; Paul Jones, Jr. of Santa Ana Valley; Harry J. Moffatt of Louis Joliet; Joe Penn of Indianapolis; Ralph I. Robbins of Merrimack Valley; Dean Saurenman of Houston; Denis L. Swan of Windsor; George J. McLaughlin of Long Island; Vice President Goodwin, ex officio; and George M. Hargreaves, staff administrator.



**FOND DU LAC—Officers and guests at Fond du Lac's student guidance program on May 16 were, from left: Neuman Reque, education chairman; Ed Reed, personnel manager of Aluminum Goods Manufacturing Co. who was toastmaster; Leyton A. Kirby, first vice chairman; Prof. Richard Sullivan, director of Commerce Dept., University of Wisconsin Extension Div., who was guest speaker; William W. Warren, secretary; Alfred E. Beurosse, treasurer; Christ S. Stelios, editorial chairman; Martin E. Kozak, second vice chairman; and Henry S. Faith, delegate.**

# Fond du Lac Host to 120 High School Seniors

Continuing a favorite annual project, Fond du Lac chapter held its traditional student guidance program on May 16 in Manitowoc, Wis. Approximately 120 high school seniors, interested in the field of engineering, were guests of the chapter for a plant tour and dinner.

Students came from Appleton, Brillion, De Pere, Fond du Lac, Green Bay, Kaukauna, Kiel, Manitowoc, Menasha, Oshkosh, Sheboygan, and Two Rivers. Accompanying them were 40 chapter members and high school instructors.

First item on the day's agenda was a tour of the Aluminum Goods Manufacturing Co., followed by a question and answer period at the Manitowoc Vocational School. William W. Warren, tool engineer and secretary of the Fond du Lac chapter, spoke to the students on "Values in Tool Engineering."

Questions were put by students to Carl Jorgensen, tool engineer; Merle Hutchins, metallurgist; and Gene Demuth, product development manager, all of Aluminum Goods Manufacturing Co.

Guest speaker at the dinner was Prof. Richard Sullivan, director of the Commerce Department, University of Wisconsin Extension Division. In his talk Prof. Sullivan stressed that while the opportunities were unlimited for students of engineering who are willing to get their hands dirty and burn the midnight oil, the choice of engineering as a profession should only be made after thorough personal evaluation of aptitudes, interests and abilities.

On May 11 Harry Weaver, vice president and director of manufacturing, Brillion Iron Works, addressed the chapter. He discussed the 'C' process of making molds and cores for foundry use.

*—Christ S. Stelios*

## Little Rock Hears Die Designing Talk

Edwin F. Stouten, president of Capital Engineering Co., addressed members of the Little Rock chapter on April 12. With the use of slides, Mr. Stouten disclosed a method of designing dies using Barrett Die-Draulic Grip. Sidney Barret, owner of Die-Draulic, Inc., was present and entered into the question and answer period.

*—Marion F. Harden*







John X. Ryneska, pictured at left, spoke at the Connecticut Day banquet. At his right is ASTE National Director Philip Marsilius who was master of ceremonies. The center photograph shows an exchange of greetings between, from left, Milton Tannenbaum; Mason Whiting, past chairman of Fairfield County; National Treasurer Ryneska; and Dr. Harry B. Osborn, Jr., immediate past president of ASTE, who was the main speaker at the banquet. The view of the head table at the right shows Director Marsilius at the mike. Seated next to him are Eugene Laistner, chairman of the event as well as chairman of Fairfield County; and Warren D. Anderson, works manager for Norma-Hoffman Bearings Corp.

# Eighth Annual Connecticut Day Attracts 350

With Fairfield County chapter as host, the eighth annual Connecticut Tool Engineer Day was held on May 10 in Stamford. A total of 350 members and guests from Fairfield County, Hartford and New Haven chapters were in attendance at Vonderlieth Hall.

It was an all-day affair starting with plant tours in the morning, a technical session in the afternoon, a social hour in the evening and climaxed by a banquet.

During the morning the groups visited Electrolux Corp., Pitney-Bowes, Inc., Norma Hoffman Bearing Corp., Homelite Corp. and Conde Nast.

The afternoon technical session held at Barnes Engineering Co. featured demonstrations of the Multra, an automatic assembly machine; Binotrol, an automatic machine tool control; Infrared, temperature and radiation instruments; and automatic plant stream instrumentation.

Gene Laistner, chairman of the event and chairman of Fairfield County chapter, introduced National Director Philip Marsilius, who in turn introduced the guests at the head table. Present were: Dr. Harry B. Osborn, Jr., immediate past president of the Society; John X. Ryneska, national treasurer; Ray H. Morris, past national president; I. F. Holland, past national president; and Willis Ehrhardt, national director.

Principal banquet speaker was Past President Osborn. He spoke on the subject "Why Good Tool Engineering Is Important to Your Business."

*—Russell E. Drescher*

## Benton Harbor-St. Joseph Hears Lecture on Sound

Chief production engineer for V-M Corp., Bailey L. Canfield addressed members of the Benton Harbor-St. Joseph chapter on May 10. Mr. Canfield related the history of sound reproduction from Edison's idea to today's fine systems both in record players and tape recorders.

Bob Williams, liaison engineer for sound effects, and Howard Lorenz, development engineer, both of V-M, gave demonstrations of stereoptic and orthophonic sound effects.

Calvin Frappier, chief tool engineer at V-M, spoke on tooling, manufacturing and assembly of parts for record changers and tape recorders.

*—Orvis L. Johnson*

## Surface Finish Control Is Topic at Montreal

F. W. Witzke, product supervisor of Brush Electronics Co., addressed Montreal chapter members on "Surface Finish Control." "Surface finish is inherent on every manufactured product, and everyone has the problem," he pointed out, explaining how different finishes are produced by various machining processes. Automotive engine life has been increased by control of surface finish.

The past chairman's pin was presented to Thomas Tracey by Chairman J. Harold Currie, and Mr. Tracey awarded the service pin and a year's membership in ASTE to Harry Welch.



BENTON HARBOR-ST. JOSEPH—Affiliate membership plaques were presented recently to three industrial representatives. From left: Robert Potter and Lester Tiscornia, Auto Specialties; Chapter Chairman Allan Ashley; Eqalt Rocks, Whirlpool Seeger; and Fred Lindenmeyer, emcee at the meeting.



GOLDEN GATE—As part of the planned speaking tour, S. E. Beer addresses an audience of Golden Gate members on May 16 at the Villa de la Paix. —*Frank Pinson*

# Speaking Tour Scheduled for 25 Chapters

Come next November, 25 ASTE chapters will have heard talks by representatives of the Monarch Machine Tool Co. The planned speakers tour, arranged by James R. Matthew of the National Program Committee, is concentrated, for the most part, on the Intermountain Area and West Coast chapters.

On the subject of "Carbide Turning for Small and Large Lot Production," Stanley A. Brandenburg, vice president of sales at Monarch and Saylor E. Beer, general sales manager for Monarch will be making the rounds.

The presentation includes two films, one covering four machines for toolroom and small-lot production, the other covering four machines, tooled and automated for large-lot production. Speeds, feeds and horsepower are discussed as well as an air gage tracer attachment.

Starting in February, Phoenix and Tucson heard the talk on Feb. 13 and 14, respectively. Potomac and Lansing chapters were added to the list in March, holding their meetings on March 1 and 12.

During April six chapters were visited including Muncie on April 3, Indianapolis on April 5, Houston on April 10, San Antonio on April 11, East Texas on April 12, and North Texas on April 13.

The May calendar listed carbide turning talks at Santa Ana Valley on May 1, San Fernando Valley on May 2, San Gabriel Valley on May 3, San Diego on May 8, Los Angeles on May 10, Santa Clara Valley on May 15, Golden Gate on May 16, Portland, Ore. on May 17, and Seattle on May 22.

Still five other chapters were on the itinerary for June. Albuquerque was listed for June 12, Los Alamos for June 13, Denver for June 14, Salt Lake City for June 15, and Nebraska for June 21.

Winding up the planned speakers tour, St. Louis is scheduled to hear the talk on Nov. 1.



LANSING—S. A. Brandenburg, right, was guest technical speaker at the Lansing chapter in March. Pictured with him are officers H. D. Robey and William Janetzke. —*R. J. Krumrie*

## City College Students Name New Officers

Herbert Dubovy was elected chairman of City College of New York student chapter at its May 17 meeting. Serving with him will be Seymour Stergelfest, vice chairman; Dominick DeMarco, secretary; John Butz, treasurer; Merrit Nesin and Elliot Kavesh, membership chairmen; Sheldon Glickhouse and Leonard Appel, publicity chairmen; M. Hartzman and D. DeMarco, technical council representative and alternate; Z. Rivlin and M. Nesin, Greater New York chapter representative and alternate; Leo Greenberg, industry liaison.

On May 10 students heard Greer Ellis of Ellis Associates, who had previously lectured on brittle coatings in experimental stress analysis, discuss the subsequent stress determinations with strain gages.

Use of Meehanite Metal in manufacturing was discussed on May 24 by Frederick Benz of Meehanite Metal Corp., who pointed out that it bridges the gap between cast iron and steel.

Two plant tours were made recently, the first to the Brooklyn plant of American Machine and Foundry Co., where they saw a cigarette-producing machine in action, as well as many other precision production machines and methods.

Hyatt Bearing Div. of General Motors Corp. at Harrison, N. J., was the subject of the second tour. Highlight of the visit was the new high-speed bearing tester, only one of its kind in the country, which determines temperature and fatigue characteristics in different parts of the bearings. —*S. Chesis*



SAN FERNANDO VALLEY—Members of the San Fernando Valley chapter heard S. E. Beer of Monarch Machine Tool Co. on May 2. Shown at the meeting are, from left: C. L. Goodspeed, treasurer; A. T. Rando, chairman; Mr. Beer; R. C. Broomell, first vice chairman; and J. R. Bethune, second vice chairman. —*A. J. Soares*

# Variety of Programs Highlight Recent Chapter Activities



BALTIMORE — LeRoy Rubright, left, retiring chairman of the Baltimore chapter, presents the service award to George Andrews, treasurer, at the installation dinner dance. David A. Schrom of the National Public Relations Committee installed officers.

## Project Vanguard Aired At Baltimore Meeting

A glimpse of the future was afforded members of the Baltimore chapter when they heard a talk by Ray Sipe of Glenn L. Martin Co. on May 2. Mr. Sipe, tool project manager of Project Vanguard, outlined the requirements of the satellite to be launched by his company on specifications by the Naval Research Laboratory.

If the company is successful in launching this tiny 20-in. diameter sphere within its theoretical orbit of plus or minus 2 deg, they expect it to remain there at least two weeks and possibly one year. Not only does the company have to launch the satellite but prove that it is in its orbit.

*—Waldo Womeldorf*



ROCHESTER—Past Chairman William B. Kamola presented the President's Award pin to John C. Laurence on March 12. Dr. Harry B. Osborn, Jr., national president for 1955-56, installed new officers and delivered his talk on "Induction Heating."

A very informative talk on tool economics was given 185 **Boston** chapter members by Henry D. Sharpe, Jr., president of Brown & Sharpe Mfg. Co. He discussed equipment evaluation and replacement procedures applicable to large and small companies. About 35 "old timers" were present to help celebrate charter member night.

E. A. March, chief metallurgist of Sanderson Halcomb Works of Crucible Steel Co. of America, was **Calumet Area's** speaker on May 14. He explained the role of high-speed and super high-speed steels in modern cutting tools. Tom Barber, former National Program Committee chairman and past chairman of Chicago chapter, was guest of honor.

**Canton** chapter was visited by the DoAll "Civilization through Tools" exhibit at its joint meeting with ASME and ASM. C. G. Schelly, director of the Wilkie Foundation, spoke.

Metal spinning with particular reference to aluminum was the topic of **Chicago's** May 14 meeting. John W. Lengbridge, project engineer of Aluminum Goods, Ltd. of Toronto, told of the latest methods of drawing and spinning aluminum.

A tour of Erie Forge and Steel Corp. was on **Erie** chapter's agenda for May. Preceding the tour Harold Myers, director of the West Works, outlined the plant's activities. The visitors then inspected the plant, beginning with the only open hearth furnace in Erie.

**Fox River Valley** members learned about hydraulics and its application to machine tools at their April meeting. David Hutchinson, hydraulic engineer with Sundstrand Machine Tool Co., outlined the standard components available for various basic circuits.

Don E. Oberg, general manager of Oberg Mfg. Co., presented an interesting talk on carbide dies, their quality and uses to **Granite State** chapter.

Hydroforming and hydrospinning formed shapes were discussed by George Beatty of Cincinnati Milling and Grinding Machine Co. at **Hendrick Hudson's** May 16 meeting. The chapter decided to present a *Tool Engineers Handbook* to an honor graduate of Hudson Valley Technical Institute and also to the school library. Members visited V & O Press Co. plant on May 5.

Ray Crawford, winner of the 1955 Mexican Road Race, and Duane Carter of the Automobile Racing Club were guest speakers of **Indianapolis** chapter on May 3. Members toured the National Automatic Tool Co. plant at Richmond recently.

**Muncie's** May program was on machine tool hydraulics, hydraulic pumps and valves, with Bert McClenegham, Chicago sales manager of the John S. Barnes Corp., as speaker.

TV Sports Announcer Chick Hearn and Bob Barnhart, plant manager of Russco, Inc., shared the speaking honors at **Peoria's** ladies night meeting.

The vast number of uses for aluminum in modern living were explored by Frank Norton, assistant industrial sales manager of Revere Copper & Brass Co. at **Riverside's** meeting.

**St. Louis** chapter's ladies night featured the answer to "What's Beulah up to Now?" straight from Miss Beulah Schacht of the St. Louis Globe Democrat.

Two plant tours have kept **Saginaw Valley** chapter busy recently. On May 17 175 members visited the Buick Axle plant at Flint and heard a talk by Master Mechanic T. R. Timm. Their April 19 visit was to the Chevrolet Frame and Stamping plant.

"Extrusions and Their Applications to Industry" was the topic of **Schuylkill Valley** chapter's May 8 meeting, with Harold Sproule, project engineer of Birdsboro Foundry & Machine Co., as speaker.

Robert L. Belmont, New England district manager for Bay State Abrasive Products Co., discussed "Solving the Grinding Wheel Mystery" at a recent meeting of **Southeastern Massachusetts** chapter.

**Tri-Cities** met May 17 to hear Harry Conn, chief engineer of Scully-Jones & Co., discuss the economics of tooling and manufacturing.

Speaker at **Wichita's** May 9 meeting was Paul E. Lundquist of Struthers Wells Corp., who showed a movie illustrating the latest in sheet metal bending and processing machines.

There are not enough technically educated men to deal with this new age of automatic controls, J. A. Bradner of Lees-Bradner told **Windsor** chapter. With preventive maintenance as his theme, he suggested steps the machine tool builder and user could take to relieve the situation. The April meeting was ladies night, with 354 members and guests attending.

## Wentworth Installs Officers at Convocation

Before an assembly of the entire student body of Wentworth Institute, presided over by President H. Russell Beatty, newly elected officers of the Wentworth student chapter were installed on May 22. Issuing the oath of office was John X. Ryneska, national treasurer of ASTE.

Joseph V. D'Avella, chairman of the Boston chapter's education committee, presented the past chairman's pin to Robert A. Cusson. Mr. Cusson, in turn, presented the President's Service Emblem to Robert Allison, chapter secretary.

Highlight of the program was the awarding of the Symbolic Keys to the winners who had competed in presenting technical talks. The talks were given by members and the best three were selected by ballot vote as to the method of presentation, interest, preparation and relationship of the subject to tool engineering.

Winners were: Harry K. Himmel, on "Metal Extrusion"—the gold key; Edwin M. Reed, on "Case Hardening by Induction Heating"—the silver key; and Lee C. Babb, on "Rolled and Formed Threads"—the bronze key.

*—Robert A. Cusson*



WENTWORTH INSTITUTE—New officers installed by National Treasurer John X. Ryneska are, from left: Harold A. Staples, secretary; George D. Washington, treasurer; Robert A. Chagnon, chairman; Charles L. MacPherson, first vice chairman; and Walter T. Belcher, second vice chairman.

## Talks at Fort Wayne

Value of the hydraulic duplicating lathe as a production tool was described to Fort Wayne members by John Hussey, sales engineer for American Tool Works Co. As coffee speaker, Past Chairman Josef A. Deck gave an interesting account of the 1956 convention and Exhibition. *—Russ Snyder*



FORT WAYNE — David Bauer, left, chairman of the Fort Wayne education committee, gave the chapter's annual presentation of a Tool Engineers Handbook to Douglas Barton, associate professor of mechanical engineering and faculty advisor for the student chapter at Tri State College.




SAGINAW VALLEY—Above are of the many students who dropped in at the ASTE booth at the General Motors Institute open house May 16, to celebrate the opening of the new GM Technical Center. A joint effort of Saginaw Valley's adult and student members, the booth offered a first acquaintance with ASTE to the thousands of high school students and members of the general public who attended.

### *Ideas Needed!*

A plea for help has been sent out by Book Committee Chairman Francis J. Sehn. His committee has just contracted with McGraw-Hill to publish a book on "Planning and Tooling for Powder Metal Parts" within one-and-a-half to two years.

The book is being written right now, and Mr. Sehn asks members with possibly useful ideas, such as designs of tools and selection of metal powders, to send them directly to him right away at ASTE National Headquarters, 10700 Puritan, Detroit 38, Michigan. Credit will be given for usable ideas.

It will be strictly practical, he emphasized, with the aim of serving everyone, not just specialists.



First meeting of the year for the National Standards Committee was held May 5 at the Statler Hotel in Detroit. Main purpose of the session was to acquaint new members with the projects and activities of the Committee. Around the table clockwise are: D. L. Swan; G. J. McLaughlin; Paul Jones, Jr.; H. J. Moffatt; Joe Penn; Louis Jensen; G. M. Hargreaves, staff administrator; D. F. Saurenman; J. E. Rotchford, chairman; A. E. Crom, vice chairman; G. A. Goodwin, Society vice president and ex-officio member; R. I. Robbins; F. J. Geoffroy; G. F. Bryan; T. W. Black, assistant editor, THE TOOL ENGINEER; and Truman Coy.



NEBRASKA—More than 150 persons attended the chapter's joint meeting with ASME and ASQC on April 6, presided over by Chapter Chairman Homer Leymaster. Speaker C. G. Schelly, director of the Wilkie Foundation, presented The DoAll Co.'s "Civilization through Tools" exhibit.—*Walter Larson*

## *Twin States Hears Quality Analysis Talk*

Twin States chapter's April meeting was a joint affair with Burlington chapter of ASQC. J. B. Pringle, staff engineer for quality assurance of Bell Telephone of Canada, spoke on quality analysis.

Jan Cameron, past chairman and national delegate, reported on the national ASTE meeting.

J. C. Dixon, engineer with Pratt & Whitney, gave a brief history of his company's contribution to precision measuring and size standards at the March meeting. Officers were installed by Wilbur Handy, first chairman of Twin States chapter.

—*V. W. Erickson*

## Buffalo-Niagara Hears Rocket Research Engineer

Rudolf Reichel, rocket research engineer for Bell Aircraft Corp., was the guest speaker at Buffalo-Niagara Frontier's May 10 chapter meeting. He discussed rockets, fuels and functions and showed a film on the Bell X-1A, which exceeded 2.5 Mach.

The April meeting saw Edward Kibbitt address the group on "Oxide Tooling for the Future." Field sales manager for Stupakoff Div. of Carborundum Co. discussed the use of Stupalox, a high-strength oxide cutting tool.

James Horne, ASTE national director, installed new officers of the chapter at a March ladies' night.

—*George I. Gasior*

## Reinertson Describes New Tooling Ideas at Purdue

New ideas in tooling were discussed by J. R. Reinertson, general manager of J. R. Reinertson & Co., at the April 12 meeting of Purdue University student chapter.

He described a new coolant, a mist that makes the workpiece cooler after machining than before, and several new gaging methods. —*R. L. Burge*

## London-St. Thomas Ladies Night Draws Record Crowd

London-St. Thomas chapter's annual ladies night at the Town and Country Club, St. Thomas, drew a record attendance of 220 members and guests who came from as far away as Windsor, Sarnia and Hamilton. Lou Jensen acted as master of ceremonies, and dancing was to the music of Don Downs and his orchestra. —*Richard J. Merriott*



SAN GABRIEL VALLEY—Honored guests at the April meeting were these officers of neighboring Long Beach chapter, shown with Host Chairman Lincoln Mager: seated from left, Ray Gariss, chairman; Mr. Mager; and Larry Pomerantz, delegate. Standing are C. W. Ward, second vice chairman; Jack B. Irby, secretary; and J. H. Medford, first vice chairman. C. P. McShane, metallurgist of Crucible Steel Co., spoke on selection and heat treatment of tool steels.—*Lincoln Mager*

## Hear Discussion of Electrical Contacts

Erle I. Shobert II, manager of research and engineering, Carbon Div., Stackpole Carbon Co., spoke at Northwestern Pennsylvania chapter's May 5 meeting. He described electrical contacts, their applications and the various materials used in their composition. Committee chairmen for the coming year were announced.

In April members heard an illustrated talk on laminated plastic by David Garrison, sales engineer with Synthane Corp. Delegate Ken Stoll reported on his visit to the National Convention and Exposition. —*H. D. Losey*



TUCSON—Speaker at Tucson chapter's May technical meeting was Harry E. Rives, left, owner of Lee Engineering Co. and field engineer for The Bellows Co., shown with First Vice Chairman Lester Detterback. In April Charles Becker, chief engineer of New Departure Div. of General Motors, spoke on "Application of New Departure Bearings to Machine Tools."—*C. J. Doubek*



PORTLAND, ME.—In a contest open to senior high school students in vocational and industrial art courses, members of Portland, Me. chapter spent a total of 200 man-hours composing, editing and preparing material for written and oral tests. In the competition sponsored by the Maine Apprentices Council, Portland chapter supervised three divisions—vocational machinist, industrial arts machinist and industrial art drafting. In addition to trophies from the Maine Apprentices Council, winners received machinery handbooks from the chapter. In the front row are Winners Barry Megquier, Richard Mosier and John Gay. In the second row are H. L. Ridlon, committee chairman; Thomas Holman; John Pierce; and George Tetreault. In the third row are R. H. Toms; Parker Stone; R. P. Chaplin; J. H. Gallant; Henry Jolin; and E. O. Bibber.

### *Australians Note!*

Any tool engineers located in Australia who are interested in ASTE activities are asked to please contact H. A. Colton, 6 Robinson St., East Lindfield, Sydney, Aus.

## Vocational Class Guests of Central Pennsylvania

Forty-five members of the senior vocation class of The Scotland School for Veterans' Children, their superintendent, Dr. Williard Stevens, and two instructors, C. A. Goldstrom and Ross Minor, were guests of the Central Pennsylvania chapter on April 5.

They assembled at the York Plant of the Caterpillar Tractor Co. for a complete tour of the installation.

Dinner was served in the Caterpillar cafeteria and the group reassembled in the auditorium to hear Dr. John C. Albohm, superintendent of York City Schools, on the subject "People and These Changing Times."

At the conclusion of the program, Central Pennsylvania chapter went on the air over station WNOW-TV for a half-hour in a program entitled "What and Who Are Tool Engineers?" David Schrom, past chairman of the chapter and currently vice chairman of the National Public Relations Committee, obtained the TV time, organized the program and acted as moderator.

—*Paul F. Leese*



KANSAS CITY—Chapter committee chairmen for the coming year are, from left: standing, Ivan J. Nelson, public relations; Ray A. Mueller, membership; Richard W. Corless, education; Don W. Hill, book; and Lewis F. Alley, editorial. Sitting are Harold W. Buddenbohm, constitution and bylaws; Merlin Grundy, professional engineering; Paul W. Arnold, standards; and Gay J. Schroer, program.—*L. F. Alley*



DAYTON—Shown with 1956-57 Chapter Chairman Francis Heberling at Dayton's annual executive and past chairman night are three national dignitaries, from left: Vice President George A. Goodwin; Immediate Past President Harry B. Osborn, Jr.; Mr. Heberling; and President Howard C. McMillen. More than 40 executives of local industries were present, and color movies of a big game expedition in Africa were shown by James Monesmith.—*Bob Bleicher*

## Racine Hears Story Of Cemented Oxides

Racine chapter's topic for May was cemented oxides, discussed by Harry H. Jason, supervisor of the midwestern district office of Carboloy Dept. of General Electric Co. His talk dealt with their history, physical characteristics, latest developments and expected uses.

Education Chairman George Strombeck announced that Ronald Hart would again be sponsored as the chapter's scholarship winner because of his excellent record at Milwaukee School of Engineering.

Racine's 28-page revised chapter bulletin, first published in February, offers greater coverage of ASTE activities and features "Bull of the Woods" cartoons as well as new advertising layouts. Chiefly responsible for the change were 1955-56 Chairman Robert Freres, Editor Ray F. Knapp and other chapter officers. —*Alvin J. Michna*



LEHIGH VALLEY—Cutting the chapter's sixth anniversary cake are Thomas J. Donovan, Jr., former national vice president and director; Ralph Mueller, retiring chairman; and Vincent Scalese, new chairman.

—*Chauncey R. Kay*

## Monadnock, Twin States Members Tour Plant

A tour of Kingsbury Machine Tool Corp. was featured at Monadnock chapter's joint meeting with Twin States chapter on May 17. Kingsbury President Gunnar Swahnberg greeted the 165 members, and Sales Manager Robert B. Vaughan recounted the firm's history and listed the wide variety of products that its machines help to manufacture.

Twin States Chairman Harold Noyes announced plans for a membership drive during the summer and early fall.

—*David A. Piper* and *Virgil W. Erickson*

## California Polytech Officers Are Elected

New officers of California State Polytechnic College student chapter, elected in May and installed at the June meeting, are Jay K. Beard, chairman; John F. Wilkin, first vice chairman; Harold A. Cantrill, second vice chairman; Neal E. Philbrick, secretary; and Rene V. Denuit, treasurer.

The Carboloy Machinability Computer was demonstrated by G. O. Murrel of Carboloy Dept. of General Electric Co.

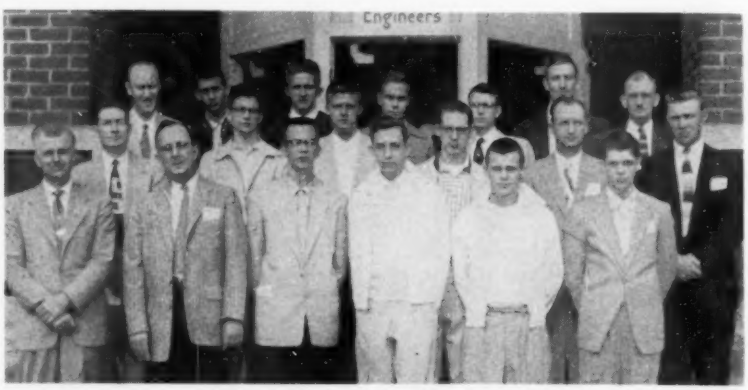
—*Jay K. Beard*

## Die Casting Discussed At Santa Clara Valley

Members and guests of the Santa Clara Valley chapter were addressed by a three-member panel from Western Die Casting Co. recently. R. H. Overshiner, sales engineer; F. K. Hartenstein, vice president of sales; and Ken Van Woert, supervisor of die design and finishing, were members of the panel.

A film, "Die Casting—How Else Would You Do It?" was also on the agenda. The men gave the history, aims and goals of the American Die Casting Institute and went into matters of tolerance and design. Program chairman for the evening was J. S. Burnett.

—*R. Wellington Madsen*




MUNCIE—Ten boys from Muncie Trade School were taken to the Purdue on-campus conference by officials of Muncie chapter with all expenses paid. In the first row are: John Scheerer, trade school superintendent; Vynul Eley, past chairman; Richard Lake; Clifford Link; Terry Barlow; and Larry Spangler. In the second row are: Frederick Burk, instructor; Ronald Caine; David Satterfield; Wayne Wilkerson; Clark Spangler; secretary; and Milton Lotz. In the top row are: Don Wedlick, chapter chairman; Max Werking; Don Satterfield; Paul Rhoades; James Duke; Clay Moody; and Lester Lotz, second vice chairman—*Arthur F. Kurtz*

## Educational Lecture Series at New Haven

During March, New Haven chapter sponsored a series of three educational lectures arranged by Dr. Stanley F. Reiter, education committee chairman. The first evening's speakers were John S. Brozek, superintendent of the tooling and Maintenance division, Sargent & Co., and Albert T. Morton, foreman of the company's tool and die department. In the second lecture Richard F. Moore, president of Moore Special Tool Co., discussed jig boring and grinding. At the third meeting Herbert Jahn of the B. Jahn Co. spoke on deep drawing in progressive dies.

Multiple spindle drilling machines which use up to 550 spindles at one time were described at the April meeting. The technical speaker was Frank Zagar of Zagar Tool Co.

A panel discussion on tool and die estimating was featured at the regular March meeting. Taking part were John C. Dixon, machine sales engineer of Pratt & Whitney; Robert Burgess, chief engineer of Greist Mfg. Co.; Jesse Barrett, superintendent of the button and fastener division, Scoville Mfg. Co., and Mr. Jahn.

*—Silas W. Becroft*




ANN ARBOR AREA—New officers of the Ann Arbor chapter are, from left: Prof. Lester V. Colwell, secretary; Dave L. Peterson, first vice chairman; Hector C. Haas, chairman; Lambert H. Fleming, delegate; Ira L. Montague, second vice chairman; and Laurence Charnitsky, treasurer.—*F. R. Boston*

## Portland, Ore. Members Hear about Solar Batteries

A recent meeting of the Portland, Ore. chapter featured a talk by C. E. Seavey on "Solar Batteries." Mr. Seavey, field and experimental engineer with Pacific Telephone and Telegraph Co., lectured members and their wives on ladies night. Following the talk, the group toured the company's long distance facilities.

*—Walter Brenneke*

## Cable Plant Toured By Syracuse Members

Syracuse chapter joined Mohawk Valley members on May 8 for a visit to the Porter Cable Co. plant, with 175 members making the tour.

Many past chairmen of Syracuse chapter joined current members to celebrate past chairmen's night on April 10.

At the technical session screw machine tooling was described by Edward P. Ranney, sales engineer for National Acme Co.

Metal cutting, cutting fluids and radioactive cutting tools were discussed by Eugene Merchant, assistant director of research at Cincinnati Milling & Grinding Machine Co. at the March meeting. As coffee speaker, Capt. Donald Bouck explained eastern coastal air defenses. *—Paul H. Hansel*



TWIN CITIES—Elected committee chairmen of Twin Cities chapter for 1956-57 are these men. From left they are: Arthur Stockwell, program; Robert R. Wressell, membership; Harland Benson, standards; George A. Minarik, accommodations; Harold Dennstedt, public relations; Frank Liljemark, education; Clifford P. Gaudette, editorial; Robert Anderson, advertising; Alf Eids Voog, professional engineering; William Kotz, advertising; and Russell W. Waldo, education. Not pictured are Norris Nelson, handbook; and Felix Mertesdorf, professional engineering.—*C. P. Gaudette*

## Long Beach Chapter Thanks Local Educators

Chairman Raymond E. Gariss made awards to five local educators for their assistance to the chapter in its ambitious education program. Dean J. E. Hollingsworth of Long Beach City College received an associate membership for his invaluable aid in establishing a tool engineering course at his school.

A certificate of appreciation went to Douglas A. Newcomb, superintendent of schools, Long Beach, for his assistance in establishing a tool engineering course in the school system. He also received a *Tool Engineers Handbook* for the Long Beach Teachers Library.

Certificates of recognition and subscriptions to THE TOOL ENGINEER magazine went to John W. Wilson, principal of Jordan High School; Neil W. Phillips, Jr., principal of Polytechnic High School; and to Eaton O. Bemis, principal of Woodrow Wilson High School. *—Gene Sisson*

## Niagara District Tours McKinnon's Delco Plant

A tour of Plant #1, Delco Div. of McKinnon Industries, Ltd., on May 3 gave Niagara District members a chance to see the manufacturing and assembly of shock absorbers, voltage regulators, generators, car radios and many other items. Plant Supervisor Walter Hambly supplied answers to the many questions directed at him during the tour.

*—F. W. Bird*

## Long Island Learns of Basic Optical Devices

Characteristics and applications of the basic optical devices were described at Long Island chapter's May meeting. Johns H. C. Steele, optical tooling engineer at American Bosch-Arma Corp., discussed the alignment telescope, precision level, collimator, optical square and many unusual applications outside the normal field of aircraft tooling.

*—Robert W. Bradshaw*



HOUSTON—Executive committee for the Houston chapter consists of: front row, from left, Paul Brainard, convention committee chairman; Paul Langdale, first vice chairman; S. E. Rees, second vice chairman; John Bailleres, chairman; C. K. Hay, secretary; Harry Betts, treasurer; and H. E. Collins, national ASTE vice president. The back row includes: Virgil Ferguson, co-chairman of standards; John S. Beman, public relations chairman; Irvin Haddon, entertainment chairman; Homer Briggs, past chairman of the chapter; W. E. Burndrett, program chairman; Howard Selby, education chairman; Gus Huge, industrial relations chairman; George Bo Linn, editorial chairman; J. W. Hindman, delegate; and Dean Saurenman, standards chairman.



ROCKFORD—Three high school students walked off with the honors in Rockford chapter's annual mechanical drawing contest. Awards were made to the winners at the May 10 meeting. Shown, from left, are: Al Rinaldi, grand prize winner of West High School; Jerry Hille of Freeport High School; Marty Lundquist of East Rockford High School; and Education Chairman Lester Teachout.

## *Harry Conn Addresses Toledo Chapter Members*

Chief engineer for Scully-Jones & Co., Harry Conn spoke to 75 members of the Toledo chapter on May 9. Subject of his talk was "Tooling for Automation," in which he stressed the importance of minimizing down time on automated machinery. As a solution he recommended use of standby tools in readily interchangeable precision holders. Judge Harvey Straub, coffee speaker, entertained the group with post-election day humor.

*—Robert S. Bollin*

## Rockford Awards Prizes To Student Contestants

Rockford's education committee presented awards May 10 to high school students who won in its annual mechanical drawing contest. Grand prize winner was Al Rinaldi from Rockford West. Other winners was Jerry Hille and Marty Lundquist.

The technical portion of the meeting brought C. H. Good before the members to discuss basics of surface finishing. Mr. Good is application engineer with Micrometrical Manufacturing Co.

*—L. E. Geiger*


## *Positions Available*

SALES ENGINEERS AND DEVELOPMENT ENGINEERS—long established Central New England machine tool manufacturer has openings for sales proposal and development engineers. Sound opportunities for men with engineering background experienced in machine tools or closely allied fields. Salaries open; advancement dependent on demonstrated ability. Liberal vacation and benefit program provided. For further information, send complete details of background to Box 063, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

OPERATIONS MANAGER—for heavy auto body die shop. Must be top executive. Age 40-48. Salary open. State age, experience and education. Replies will be treated in strict confidence. Write to Box 079, News Department, The Tool Engineer, Detroit 38, Mich.

## *Position Wanted*

HARD WORKING ASTE MEMBER—offering 15 years sales experience in tools and abrasives to a reputable manufacturer of perishable tools interested in an aggressive sales program in the Pacific Northwest. Best of references. Write to Box 078, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.


## High School Education Awards Made by Lansing

Lansing chapter's May 14 meeting was highlighted by the announcement that ASTE High School Education



Schenck



Goebel

Awards of $100 each will go to Dale R. Goebel of Everett High School and Jack Lee Schenck of J. W. Sexton High School in Lansing.

The relatively new field of ultrasonic machining came up for discussion by Ralph M. Moschella, manager of sonic products industrial equipment sales of Raytheon Mfg. Co.

About 50 members traveled by bus to the new General Motors Technical Center on June 1. *—R. J. Krumrie*

## C. M. Beach Speaks To Dayton Members

Using Walt Disney-like caricatures, Carl M. Beach presented a talk on machine tool replacement for the members of Dayton chapter on April 9. Mr. Beach, vice president of Cincinnati Milling Machine Co., showed the audience of 81 at Suttmillers Restaurant how obsolescent machine tools waste money.

Spark gap tracer control for machine tool applications was the subject of the Dayton chapter's March meeting. The technical lecture was delivered by Edward Kirkham of Pratt & Whitney Co., Inc. —*Robert Bleicher*



CENTRAL PENNSYLVANIA—Panelists from Central Pennsylvania chapter who appeared on a half-hour television show entitled "What and Who Are Tool Engineers," are from left: A. E. Linden, assistant manager of manufacturing, Caterpillar Tractor Co., membership chairman; J. G. Williams, owner of Williams Tool Co., first vice chairman; D. A. Schrom, plant superintendent, Commercial Div., York Corp., past chairman and vice chairman of the National ASTE Public Relations Committee, who acted as moderator; E. T. Wenrich, industrial engineer, York Corp., chairman; B. C. Stambaugh, president and treasurer of Hanover Tool Co., past chairman; and E. J. Haverstock, manufacturing engineer, Commercial Div., York Corp., program chairman.



PONTIAC—First Vice Chairman James H. Elliot, left, Speaker Russel F. Holmes, standards engineer with AC Spark Plug Div. of General Motors, and Chairman Andrew E. Forster display the unified and American screw thread standard and also the screw thread section of the SAE drafting section.—*C. E. King*

### *Kerr Speaks at Binghamton*

T. A. Kerr of Aircraft Marine Products, Inc. discussed electric terminals and connectors at Binghamton chapter's May 2 meeting. Films were shown on the use of the high-speed camera in detecting and solving form die problems. —*Glyn Williams*

### Multiple-Spindle Drilling Discussed

Multiple-spindle drilling, reaming and tapping operations were discussed by President Frank Zagar of Zagar Tool Co. at the May meeting of the Northern Massachusetts chapter. The Gardner Junior High School Band, directed by Miss Louise Livingston, gave a concert before the meeting.

—*Herman A. Wojdylak*



GREATER LANCASTER—Speakers at the Greater Lancaster April 10 meeting were: Edward E. Hopper of The Cross Co., left; and Edward Forth of DeWalt, Inc., subsidiary of American Machine & Foundry Corp.



SANTA CLARA VALLEY—Pictured at a recent meeting of the Santa Clara Valley chapter are, from left: William T. Wright, chapter chairman; Jack Pangburn, twice chairman of Binghamton chapter; Phil Taylor, past chairman of Binghamton chapter; and Frank Menard, national delegate. Messrs. Pangburn and Taylor transferred to the new IBM plant in San Jose, Calif.

## Lima Scholarship Goes to MIT Student

A scholarship was awarded by Lima chapter to Carl D. Steuber of Coldwater, Ohio, a student at Massachusetts Institute of Technology.

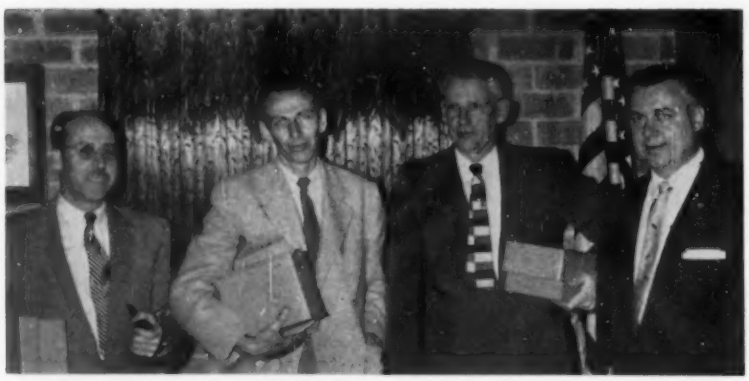
At the May meeting William McKinsey, Jr., manager of the parts handling department of Syntron Co., discussed the theory and practical application of vibratory bowl feeders for small parts. As a demonstration he had two small bowls in actual operation. The annual golf stag party was held June 9 at Lost Creek Golf Course.

"Selection of Special Machinery" was the April topic of Edward E. Hopper, sales engineer of The Cross Co. He described machines which drill, ream, bore and tap automatically. Members toured the Goodyear Rubber Co. plant at St. Marys, Ohio, recently.

—*George Johoske*



LOS ANGELES—"Family Night" for the Los Angeles chapter meant an enlightening tour of the new Police Administration Building and facilities in downtown Los Angeles. Policewoman June Candland conducts a group through the modern $7-million-dollar law enforcement center.



SANTA ANA VALLEY—Wayne Ewing, right, national ASTE vice president, presented three educators with awards from the Santa Ana Valley chapter for their efforts in fostering the study of tool engineering. They are, from left: E. Saferite of Fullerton Junior College, Mr. Rockey of Orange Coast College and H. Mooma of Santa Ana Junior College. Awards were one year's subscription to THE TOOL ENGINEER, the *Tool Engineers Handbook* and the *Die Design Handbook*.



BALTIMORE—Executives of the Baltimore chapter include, seated, from left: Louis Grill, standards chairman; Andrew Jones, advisory council; Donald R. Dorf, program chairman; and Waldo Womeldorf, program chairman. Standing are: John F. Murphy, membership; Neil Heller, membership; James J. Fitch, entertainment chairman; Robert S. Smith, constitution and bylaws chairman; and Roy Pyrene, chairman.
*—Waldo Womeldorf*

## *Lawrence Tech Members Hear Carbide History*

History of carbides, ball milling and pressing of tungsten carbide were described to Lawrence Institute of Technology student chapter members at their May 2 meeting. With the aid of a movie, Larry Gault, assistant to the president of Wesson Co., discussed presintering, cutting and shaping and sintering operations involved in the manufacture of tungsten carbide for cutting tools and tips.

Special guests included Leonard Lovings, Detroit chapter chairman, and Kenneth Kuhn, education chairman. Mr. Lovings congratulated them on being the third largest student chapter, with 80 members. *—Ken Kuhn*

## Dr. J. C. Hamaker, Jr. Talks to Hamilton

Manager of the research department, Vanadium Alloys, Latrobe, Pa., Dr. J. C. Hamaker, Jr., spoke before members of the Hamilton chapter on March 9. His subject was "Cutting Tool Materials and Heat Treating."

Another highlight of the program was installation of new officers carried out by George Churchill, past chairman and member of the National Membership Committee. New Chairman J. Sheldon was presented with an engraved gavel on behalf of Delta Secondary School in Hamilton.

On the subject "Economics of Tooling and Manufacturing," Harry Conn addressed members of the Hamilton chapter on May 11. Mr. Conn who is chief engineer for Scully-Jones & Co., described the s c i e n c e of spending money, pointing out that in each plant there are three factors which govern economics—quantity, quality or tolerances, and method.

During April Hamilton chapter held its annual ladies night which was attended by 320. Entertainment was by the International Harvester male chorus.

*—Russell Wilson and W. A. Marcellus*

## *Springfield, Ohio Group Tours Frigidaire Plant*

Highlights of Springfield, Ohio, chapter's March meeting were installation of officers and a tour of the Moraine City plant of Frigidaire Div. of General Motors. The installation was conducted by George A. Goodwin, national ASTE director.

Sam Alspaugh, master mechanic for Frigidaire, spoke on tooling for difficult parts. *—Kenneth W. Keller*

## Portland, Me. Chapter Visits Local Company

Members of Portland, Me. chapter visited Hyde Windlass Co. on May 11 for a view of manufacturing steps of precision marine machinery. They saw everything from pattern shop to assembly floor, then heard a talk by Ned Andrews, plant superintendent. Henry B. Hagman, electrical engineer for Sylvania Co., also gave an informal talk on the future of electronics.

*—Joseph H. Gallant*



PATERSON—As guest of honor at "Tom Donovan Night," Former National Director Thomas J. Donovan receives a plaque for his outstanding efforts and guidance in chartering and helping to organize Paterson chapter. From left are: Alex MacIntosh; Frank Rizzuto, second vice chairman; Sam Boyer, past chairman of Philadelphia chapter; Charles Bazaz, Paterson's first chairman, presenting the plaque; Robert Neeb, first vice chairman; George Fleming, chairman; Mr. Donovan; William Aucamp, treasurer; and Conrad Corsini, delegate. Awards presented that night included: outstanding service award to Program Chairman Bruno Marsilio; *Tool Engineers Handbook* to Tom Messineo; and past chairman's pin to Park Groff, Jr.—*Charles Bazaz*

## Hydro-Electric Dam Construction Discussed

Frank E. Fahlquist, geologist and foundation engineer, was Little Rhody chapter's May technical speaker. Drawing from his personal experience, he discussed construction of hydro-electric dams and other lease engineering in Africa, Iran and South America.

About 20 Little Rhody members attended the ASTE Regional Conference in Worcester on April 30.

*—Richard Kilbane*

## Speaks on Metal Pressing

"Metal Pressing" was the technical subject of Gordon Sommer, chief development engineer of Clearing Machine Co., at Muskegon chapter's May 8 meeting. Various phases of the latest developments in automation of large press operations were illustrated by Mr. Sommers.

*—Jack Jilek*

## Cincinnati Hears Report, Installs New Officers

The chairman's report to the chapter, installation of new officers and a technical program on hydraulics highlighted Cincinnati chapter's March meeting.

"Hydraulics as Applied to Industrial Machinery" was the topic of E. O. Clark, industrial product sales manager of Vickers, Inc., who traced the different applications of simple and complex hydraulics in machine tools. A color movie on bauxite, produced by the Dominion Alumina Corp. of Canada, was shown. *—Moler A. Duff, Jr.*

## *Air Power Seen Aid to Low-Cost Automation*

"Air Power—Key to Low-Cost Automation" was the topic of Milwaukee chapter's May meeting, with Gene R. Voight, assistant sales manager of Air Tool Div., Aro Equipment Corp., as speaker. He outlined the development and uses of air power tools and their advantages in controlling feeds and speeds.

Don Anderson, Aro's Milwaukee representative, demonstrated the use of Par-A-Matic drill head for drilling and tapping.

Atomic energy was discussed in April by Malcolm F. Judkins, manager of the New Products Div., Firth Sterling, Inc., who answered many questions about atomic masses and metals used in conjunction to provide protection.

*—Walter Behrend*




SOUTH BEND—Harry Hartz, one time champion of the Indianapolis "500" classic, displays a souvenir picture of the race to members of the South Bend chapter. As guest speaker he told much of the colorful history of the track, cars and drivers. From left are: Tom Douthart, Otto Schaffer, Mr. Hartz, E. James Nelson, John Berker and Paul Roberts.—*Harold I. Housewerth*

## Ladies Night Dinner At Grand River Valley

More than 250 members and guests of Grand River Valley chapter gathered at Leisure Lodge for the annual ladies night dinner, with visitors present from Brantford, Hamilton, Windsor and St. Catharines.

Chairman Clayt Henderson presented J. Strite with his past chairman's pin and introduced the guests of honor, including the chapter's charter chairman, Harry H. Whitehall.

*—Grant Alpine*

# members on the MOVE

National Vice President **H. E. Collins** has been appointed manager of overseas manufacturing operations for Hughes Tool Co., Houston, Texas. He was also named director of Hughes Tool Co., Ltd., United Kingdom.

**Grant Wilcox** of Detroit chapter is now associated with Ross Operating Valve Co. as plant manager.

**Clyde T. Mooney,** who was chairman of Detroit chapter in 1942, has joined Engineering Service, Inc., of America as president and general manager. He was formerly vice president and general manager of Pioneer Engineering Co.

**Joseph J. Balciunas,** 1955-56 chairman of Hartford chapter, has been named manager of the R. T. Palmer Co., Inc.

**W. E. Brainard** of Los Angeles chapter has been appointed chief engineer of the Aircraft Machine Tool Div. of Kearney & Trecker Corp.

Union Twist Drill Co. has announced the appointment of **Martin C. Butters** of Northern Massachusetts chapter as general manager of Butterfield Div. at Derby Line, Vt., and Rock Island, Quebec.

A member of Cleveland chapter, **J. H. Sacash** of Bedford, Ohio, has formed his own company, Sacash Spring Engineering Co.

A tool engineer with Onsrud Cutter Mfg. Co., **E. R. Johnson** has become a registered professional engineer. He is a member of Chicago chapter.

Jones & Lamson Machine Co. has announced appointments of two Twin States chapter members. **John E. Barbier,** former manager of the thread tool division, has been named to the newly created post of manager of engineering, and **W. F. Couts,** former sales manager of the thread tool division, is now manager.

**Jack Grundy** of Houston chapter has been named factory manager for Reed Roller Bit Co., an oil well drilling firm.

New manager of the gage inspection department at IBM's Endicott plant is **William A. Allen** of Binghamton chapter.

A San Antonio chapter member, **James B. Frix,** has become a registered professional engineer in Texas. He is area engineer with the Corps of Engineers, Fort Worth District.

Reorganization and future expansion of Empire Tool Engineering Co. is announced by **F. L. Ballentine** and **Edward T. Rogers,** who formed the company early this year. Both members of Tucson chapter, Mr. Ballentine is vice president and Mr. Rogers is secretary-treasurer.

**James Y. Scott** of Springfield, Mass., chapter, has resigned as president and director of Van Norman Industries, Inc. The firm also announces appointment of **Paul C. Eberhardt** of Paterson chapter as assistant to the president for manufacturing and research.

**Howard W. Arnold,** a member of Calumet Area chapter, is now manager of distributor sales for Carboloy Dept. of General Electric Co. in Detroit.

Merit Machinery, Inc., has made **Donald J. Beecher,** Erie chapter member, its representative in Erie and northern Pennsylvania.

Two ASTE members have recently been promoted by Universal-Cyclops Steel Corp. **C. Clement English** of Dayton chapter is now manager of high temperature metal sales, and **Walter E. Baker, Jr.,** of Pittsburgh chapter will be the company's Pittsburgh sales manager.

**Robert W. Miller** of Cincinnati chapter, member of the National Membership Committee, has become associated with the Process Machinery Div. of Cincinnati Milling Machine Co.

A member of the National Research Fund Committee, **G. W. Trichel** has been named president of Amplex Div. of Chrysler Corp.

Columbia Tool Steel Co. has appointed **Jess N. McCombe** of Chicago chapter district sales manager of the Milwaukee branch for the Wisconsin territory.

Caterpillar Tractor Co. has named **William F. Salter** of Louis Joliet chapter to be general foreman of tool control at its Glasgow, Scotland plant.

Formation of Graphic Engineering & Sales, Inc. has been announced by **Donald D. Welbaum,** president and general manager. He was chairman of Fort Wayne chapter in 1953-54.

**Robert L. Spitler** of Fort Wayne chapter has been named manager of the manufacturing section of General Electric Co.'s newly formed gear motor and transmission components department.

Clearing Machine Corp., a division of U. S. Industries, Inc., has appointed **Earl R. Dew** of Toledo chapter as its sales representative for the Toledo territory.

**Walter J. Mollenauer** of Pittsburgh chapter has joined the administrative sales staff of Vulcan Crucible Steel Div., H. K. Porter Co., Inc. **Lester C. Hill,** also a Pittsburgh chapter member, has been promoted to general sales manager of Vulcan.

**Edward J. Novack,** Detroit chapter member, has been appointed special representative to machine tool builders for Kennametal, Inc.

A Fairfield County chapter member, **Merton C. Grilley** has been named vice president of The Producto Machine Co.

Appointment of **Frank W. Jenkinson,** Cleveland chapter member, as Cleveland district manager has been announced by Adamas Carbide Corp.

What is believed to be the world's first sectional tubeless auto tire has been invented by **Samuel C. Pellegrino** of Buffalo-Niagara chapter. The tire is now undergoing final laboratory testing before being introduced to the public. Designed as a safe high-speed tire, it has 12 separate sections and can be repaired easily without use of a jack.

Norton Co. has announced the retirement of **Arthur L. Rakestraw,** its Chicago field engineer and member of Evanston chapter, after 28 years with the company. Another ASTE member, **Robert P. Cooper** of Los Angeles chapter, has been named abrasive engineer by Norton.

Two Little Rhody chapter members have been elected to new positions at Pratt & Whitney Co., Inc. **Edward P. Gillane,** president of Potter & Johnston Co., a subsidiary of Pratt & Whitney, has been named executive vice president and a director of the parent company. **J. Potter Cunningham** will succeed him as president of Potter & Johnston.

**Douglas Graham** of Chicago chapter has been appointed product manager of Elgin National Watch Co.'s abrasives division, and will be in charge of Elgin's new carbide tool program.

A member of Boston chapter, **John Sutcliffe** has joined the Waltham laboratories as engineer in the projects department.




CALUMET AREA—Dr. Mario Martellotti, center, of Cincinnati Milling Machine Co., addressed members of the Calumet Area chapter on "Milling Cutter Design and Operating Factors" at the Cape Cod Inn on April 11. He is flanked by Dave MacGregor, left, chairman, and E. W. Menke, program chairman.



AKRON—Members of Western Reserve, Canton and Cleveland chapters were guests of the Akron chapter for a tour of the Portage Machine Co. recently. More than 700 attended the event.—*Frank A. Flannery*

## Obituaries

**Harvey M. Allison** of Worcester chapter, chief engineer of John Bath & Co.

**John L. Avelar** of Southeastern Massachusetts chapter, tool department foreman at J. C. Rhodes Co.

**Dr. John J. Caton** of Detroit chapter, elected to Honorary Membership in the Society in 1938, second to be so honored, retired director and founder of Chrysler Institute of Engineering.

**Laverne R. Cooper** of Los Angeles chapter, sales engineer with Pacific Abrasive Co.

**Harry E. Fortney** of Los Angeles chapter, administrative tool engineer at Douglas Aircraft Co.

**John M. Johnston,** charter member and past chairman of Portland, Me. chapter, master mechanic, Oxford Paper Co., Rumford, Me.

**Charles A. Olson,** charter member and secretary of Fox River Valley chapter, retired research engineer with the Crane Co.

**Francis A. Paquin,** charter member of Newark and Paterson chapters, president and founder of Paquin Designing Co.

**Leo P. Schade,** past chairman of Potomac chapter, production control specialist at Naval Research Laboratory.

**James N. Skinner** of Hartford chapter, vice president of Skinner Chuck Co.



PEORIA—Visiting annual Science Fair at Pekin High School with one of the students are Education Chairman Russ Saurs, center, and Committeeman John Schrock, right. More than 6,000 attended the fair which was sponsored jointly by Peoria chapter and 30 other technical societies and industries. Mr. Saurs received a certificate of participation for the chapter's excellent exhibit and assistance.—*George K. Davison*

## coming ASTE meetings

### National

SEMIANNUAL MEETING—of the National ASTE Board of Directors, Oct. 25-26. The Greenbrier, White Sulphur Springs, W. Va.

ASTE 25th Annual Meeting will be held March 25 through 27, 1957, at Houston, Texas.

### Chapter

FOX RIVER VALLEY—July 27, St. Andrews Country Club, St. Charles, Ill. Annual golf day.

LONG BEACH—July 11, 7:30 p.m. The Petroleum Club. Panel discussion on "Tooling for Adhesive Bonding" by C. L. Sullivan, tool engineer, Douglas Aircraft Co.; Jake Walkey, manufacturing and research engineer, Lockheed Aircraft; Carl K. Fredericks, associate director of research and development, Narmco, Inc.; Clive Blankenship, research engineer, Douglas Aircraft Co.

SANTA CLARA VALLEY—July 17, 6 p.m., San Francisco Naval Shipyard. Cmdr. E. F. Wasem, Jr., shop superintendent, will speak on the history of naval tooling and tool standardization developments.



UTAH STATE COLLEGE—New officers of the Utah State student chapter are, from left: Seth Beck, treasurer; Albin Kowalewski, secretary; Monte Beers, vice chairman; Lewis Myers, vice chairman; and Ross Bowman, chairman.

# BURGMASTER®

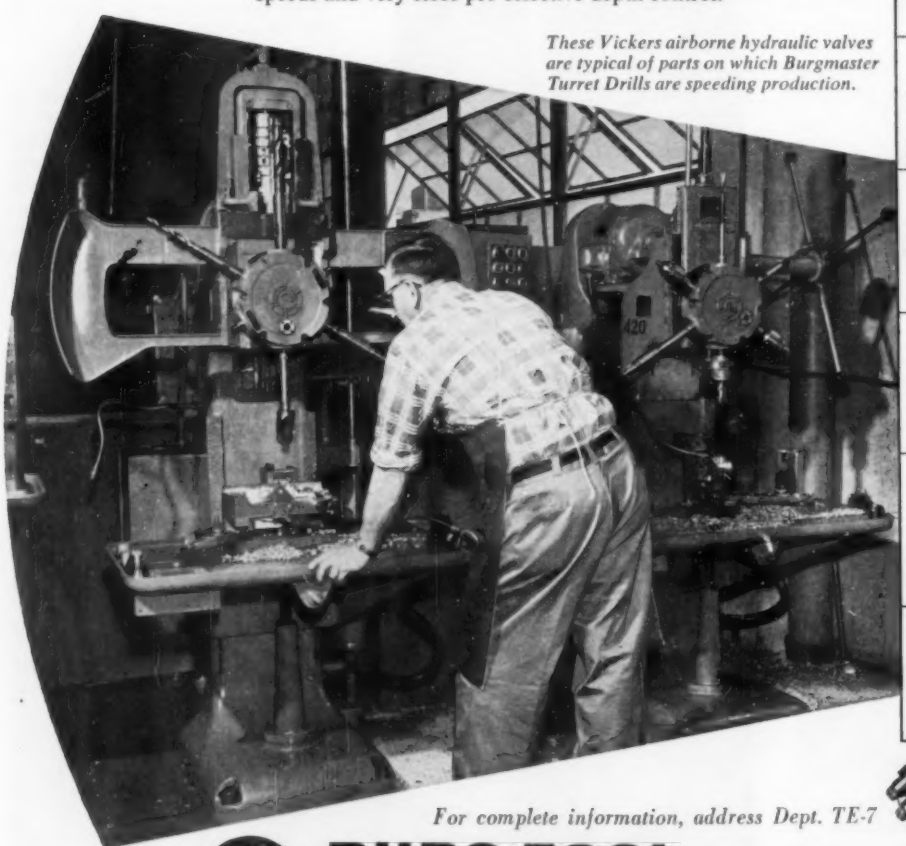
POWER INDEXING

## *Turret Drills*

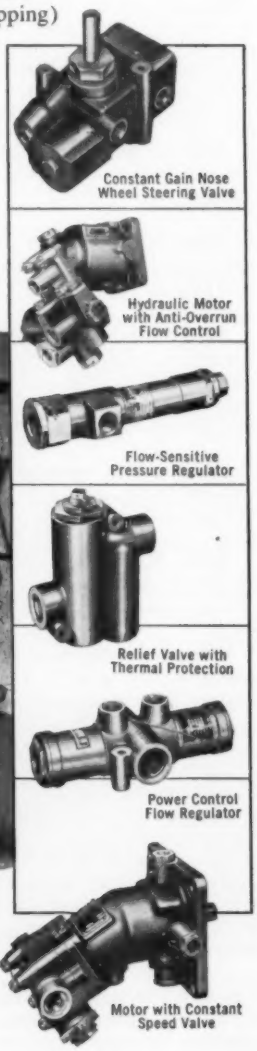
### step up AN porting operation 25% at Vickers, Incorporated

Vickers, Inc., Div. of Sperry Rand Corp., El Segundo, Calif., manufacturers of hydraulic equipment, use both hand-operated and automatic hydraulic Burgmaster Turret Drills in their production lines. The company states that the AN porting operation on hydraulic valves has been stepped up approximately 25% over the old single spindle method. Vickers have found that the Burgmasters maintain sizes accurately, are easily set up, and perform multiple operations (drilling, reaming, counterboring, tapping) in one set-up, with one operator—automatically.

Automatic hydraulic Burgmasters (6 and 8 spindle models) feature skip indexing, automatic cycling and infinitely variable preselective feeds. All models (including the 6 spindle manuals) provide power indexing, pre-selective spindle speeds and very close pre-selective depth control.



*These Vickers airborne hydraulic valves are typical of parts on which Burgmaster Turret Drills are speeding production.*




*For complete information, address Dept. TE-7*

**BURG TOOL**
*Manufacturing Company, Inc.*
15001 South Figueroa Street, Gardena, California
*Sales Office:* New York · Chicago · San Francisco

# PROGRESS IN PRODUCTION

## MULTI-MILLION-DOLLAR CENTER HOUSES ULTRA MODERN FACILITATES FOR INDUSTRIAL RESEARCH

Dedication of General Motors' multi-million dollar Technical Center has centralized one of the world's important industrial research centers. More than 4000 engineers, researchers, stylists, designers, mechanics, machinists and other specialists work in the center which includes 25 buildings spread over a 330-acre area. Four central staff organizations involved in the project include the research staff, engineering staff, styling and the process development section (part of the manufacturing staff).

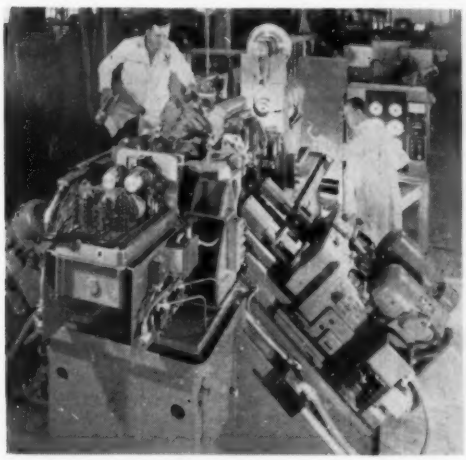
At the Center, emphasis is on advanced engineering and research. Engineering staff projects usually look ahead at least three to five years, while research projects extend even further into the future.

Of particular interest to tool engineers is the process development section which works on engineering studies and experimental exploratory projects to improve manufacturing techniques and processes that improve plant efficiency, increase quality and lower product cost. Facilities of the department, while, like all phases of the Center, are available to GM divisions for new developments, services, technical aid, advice and consultation, are primarily beamed toward future and to ideas anticipating what the divisions may be looking for in future production or manufacturing plans. Of interest to this department are such questions as how new developments in electronics, metallurgy, chemistry, physics can be applied to manufacturing methods. Current studies in this project development section are those concerned with special machinery and automatic assembly.

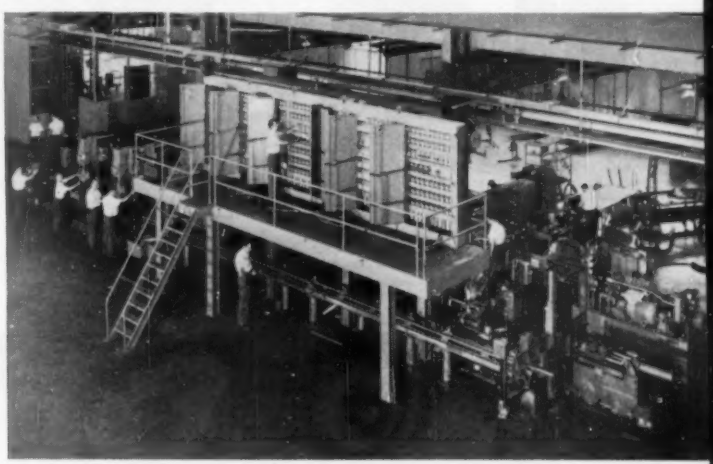
The present ultramodern center styled in contemporary architecture and set in a campus-like atmosphere, culminates years of growth from its innovation in 1911.

Ideas, new processes, instruments, mechanical devices and research developments flowing from the Technical Center often channel to industry generally through technical groups. Occasionally other developments grow as byproducts

**Among the advanced equipment housed in the Technical Center is this complete automotive engine balancing machine developed by GM research staff for use in production of Chevrolet engines.**



**Engineers of the process development section cooperated with those of Detroit Transmission Div. to develop this torus assembly machine which now is producing parts for hydramatic transmissions at the Detroit Transmission Div.'s Willow Run plant.**



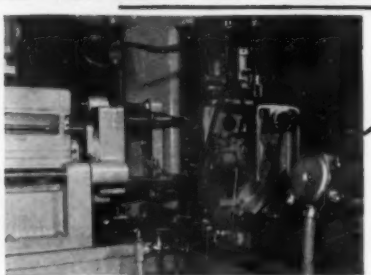
out of the special projects; such as a new type of instrument that industries remote from auto manufacturing can use for inspection and quality control. An example of the type of work carried on at the Center which benefitted industry in general was the research done last year when GM research staff teamed up with National Lead Co. and the National Bureau of Standards to develop zinc base alloy standards, so that any laboratory or production plant could compare composition of heats or melts of zinc base alloys in production. As a result, National Bureau of Standards now makes sample bars available to industry. Certified composition of these can be accurately compared by quick spectrographic analysis with composition of zinc alloys in production, and any producer by this comparison can find out whether his production run meets the standard.

Work is continuously reported to technical societies so that results may be applied to problems in other industries.

Most advanced equipment is housed in the new Technical Center. Among the modern designs is an electronic computer which designs, theoretically, a gas turbine engine in a matter of minutes. The equipment, which is a mathematical computer, is capable of making as many as 14,000 computations per second. With it, engineers can determine how a given engine design would operate if it were actually fabricated of metal.

Among other outstanding equipment is a development created by the special problems department to measure, locate and automatically correct unbalance in the torus assembly for the Hydra-matic transmissions at Detroit Transmission Div. An electronic computer finds the trouble point and the amount; then a spot welder adds a piece of metal opposite the heavy side of the unit to compensate for the unbalance. This piece of metal is measured in variations of as little as 0.001 in. Before the torus leaves the balancer, it is given a check spin; if still not within tolerance limits, it is automatically rejected.

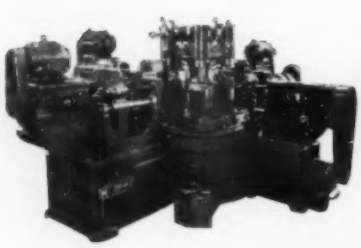

AUTOMATE



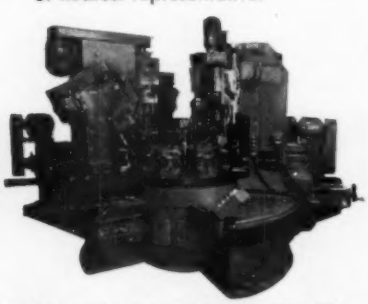
Four-way special machine drills, reams, spot-faces and hollow mills lawn mower housings. Hand loading is followed by automatic clamping which starts the machining cycle.

Your Metal Working Operations with WISCONSIN Special Machines

● Specially designed machines by WISCONSIN can help you automate your high production drilling, tapping, reaming, boring, spotfacing and milling operations. A few typical examples are pictured here. Write WISCONSIN *today* for complete information, or name of nearest representative.



Special four-way machine drills and taps several different sizes of V-4 engine blocks. Machine and fixtures are designed to utilize interchangeable fixed center drilling and tapping heads.



This special eight station machine drills, reams, spotfaces, taps and mills 3 different sizes of connecting rods for outboard motors. It features automatic clamping and utilizes adjustable spindle drilling and tapping heads at various stations.

WISCONSIN DRILL HEAD CO.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-146


## RYERSON DEVELOPS STEEL CODING SYSTEM

New color coding system for identification of its carbon and alloy steels has been developed by Joseph T. Ryerson & Son, Inc. Provision has been made for tagging shipments with a listing of the new colors and what they indicate until users become familiar with the new system. Each color used has a definite meaning in the system.

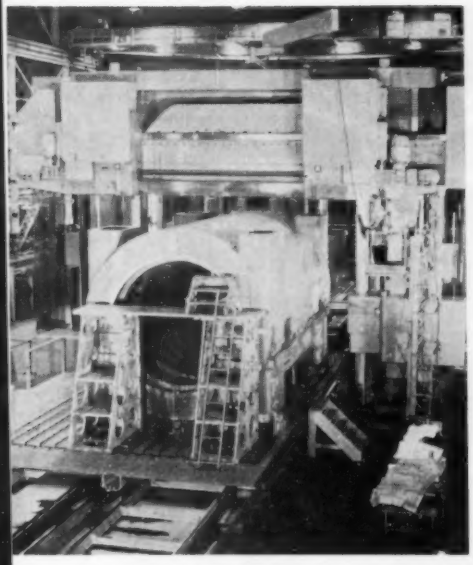
Single colors are used to identify standard carbon and carbon manganese steels. Green, blue, yellow and pink always define carbon content. Centered dots of these carbon colors indicate the heat treated condition. Centered dots of other than the carbon colors identify characteristics other than analysis, carbon range or heat treated condition. Purple, black, white, orange, gold and brown designate related groups of steels. Red, in any form, always indicates special ground finish.

Alloy steels are usually designated with two colors, one indicating the particular analysis group and the other carbon content.

## MAMMOTH MILLING UNIT READIED FOR WORK

Considered the largest unit of its kind, this adjustable rail milling machine undergoes final tests at Ingersoll Milling Machine Co.'s Rockford, Ill., factory. It weighs 625 tons and will be used in the manufacture of large turbine-generator parts. The unit, which stands 35 ft high, 42 ft wide and 120 ft in over-all length, is capable of working on metal parts 18 ft wide, 16½ ft high and 50 ft long. When installed at the Schenectady plant of General Electric Co., it will represent an improvement of more than $1½-million in equipment.

In spite of its tremendous size, this machine must work to very close tolerances. Joint surface of the low pressure hoods must be machined to within 0.003 in. of being flat over all. Workpieces are



carried on two 16-ft wide tables which move along the 112-ft bedways. The tables are 22 ft and 30 ft long. While work mounted on one table is being machined, the other table is parked at one end of the machine for loading and unloading.

One operator controls the various elements of the machine from a portable pendant. With pushbuttons, switches and dials, he can start, stop and speed up their movements or lock them in place.

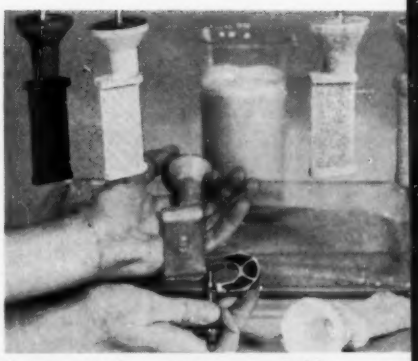
## ECONOMICAL METAL CASTING WITH GLASS POWDER MOLDS

Low-cost precision metal casting is being accomplished by a technique utilizing one-piece glass powder molds. This Glascast method, developed by Corning Glass Works for casting close tolerance precision parts of high temperature alloys, follows the lost wax investment casting technique in certain aspects. However, it requires no investment material or containers, dewaxing ovens, power equipment to move investments or any knockout equipment.

Lightweight molds are made by dipping a wax pattern into a Glascast slurry, coating it with coarser Glascast grains, and, after drying the assembly, dipping and coating it several times in order to build up the mold shell. The assembly is then fired (which simultaneously removes the wax pattern), and the mold is ready for casting without further treatment. The one-piece molds, capable of withstanding extremely high heats and sudden temperature changes, yield blemish-free castings with surface finishes of 20 to 40 microinches. Their resistance to thermal shock permits pouring of metal alloys with high melting points into a cold mold without risk of its cracking. Preheating, however, is recommended.

The entire process, according to Corning engineers, is adaptable to assembly line practices. Time between wax pattern makeup and casting averages about 24 hours.

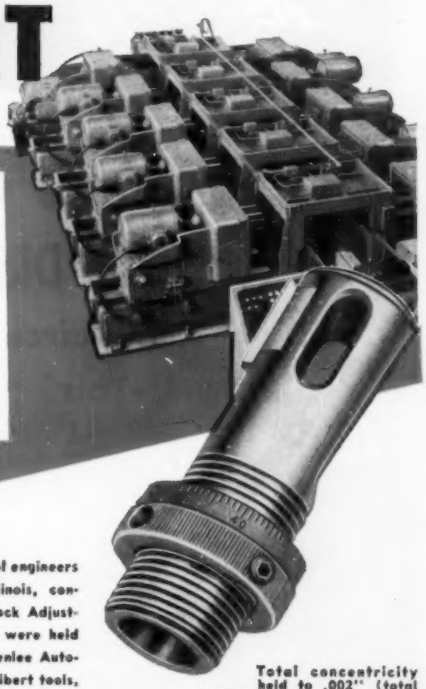
Basic equipment needed for this disposable pattern process are mixing containers, high-speed propeller mixers, rollers, stoppered bottles, dipping troughs, grain coating boxes, and a furnace capable of 2000 F temperatures. Regular lost wax pattern dies are used for the patterns.



**Tolerances for castings are held to 0.005 per in. Sequence of process is illustrated by samples at top from wax pattern at extreme left, through dipping in Glascast slurry and coating with grains to completed mold shell.**


SEIBERT
ADAPTERS

well within tolerance standards *say* GREENLEE ENGINEERS



● More than 5 years ago, tool engineers at Greenlee Bros. & Co., Rockford, Illinois, conducted extensive tests on Seibert Shur-Lock Adjustable Adapters to determine if tolerances were held within their standards. As a result, Greenlee Automatic Transfer Machines, equipped with Seibert tools, are to be found in operation today in many of the world's largest mass production plants. Quality, service and price are the three reasons hundreds of users, like Greenlee, are today specifying Seibert tools. There is an experienced Seibert representative in every key industrial area to work with you in solving your specific tool holding problems.

Total concentricity held to .002" (total indicator reading) 6" from end of Adapter. Manufactured to GMC, Ford, Chrysler, and ASA standards.



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New brochure illustrates and describes Seibert's complete line of Holding and Driving Tools. Write for your copy.



Shur-Lock Adapter Bodies



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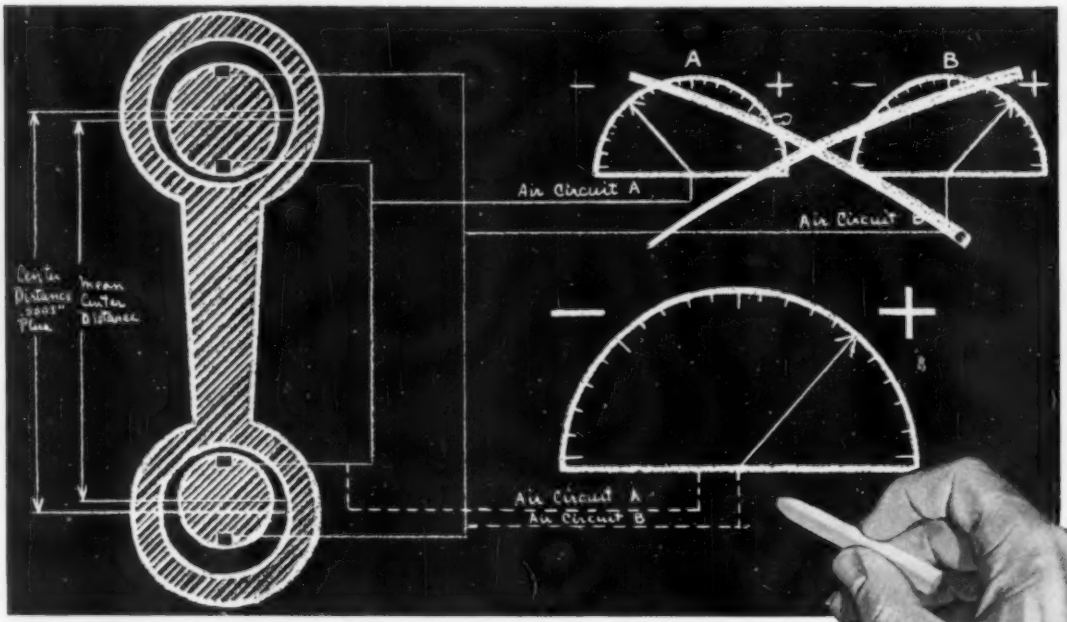


Spindle Extension Adapter Assemblies

SEIBERT SEIBERT & SONS, INC. CHENOA, ILLINOIS

*Quality* MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

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# NOW! Gage Center Distance with Just One Dial

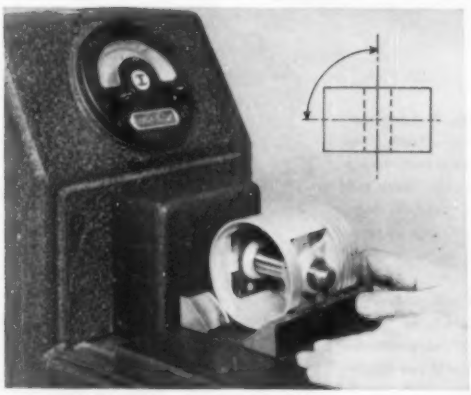
## ...using a Taft-Peirce Comp-U-Tair*



Gage parts twice as fast — and far more easily — with this exclusive T-P *computing* air gage . . . the Comp-U-tair.

Checking a dimensional relationship like center distance, for example, is greatly simplified. The Comp-U-tair measures, computes, and indicates the result on a *single* indicator with *one* pointer. The Comp-U-tair is a *differential air gage,* in which two air circuits are applied to opposing sides of the differential device. Gaging nozzles are placed so that diameter variations cancel each other and have no effect on true center distance reading. Operator reads just one dial, does no calculating, and has an instant, positive indication for every part — in or out of tolerance, plus exact amount and direction of variation.

Streamline your gaging with the unique Comp-U-tair. Call Taft-Peirce to save time and money throughout your inspection operations. As a starter, write for Air Gage Catalog No. 613.



**The Comp-U-tair does many other jobs . . .**

One big time-saver is measuring squareness, shown above. Squareness is indicated on *one dial* with *one pointer.* The Taft-Peirce Comp-U-tair figures as it measures, can be designed to check several dimensional relationships *simultaneously.* Number of dials is cut in half . . . inspection is faster, more accurate.

*Patent Pending

**THE TAFT-PEIRCE FAMILY...**

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- Precision Gages
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- Lapping Machines
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# TAKE IT TO TAFT-PEIRCE

TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

T-P Means TOP Precision

# TOOLS *of today*

## Universal Turret Lathes

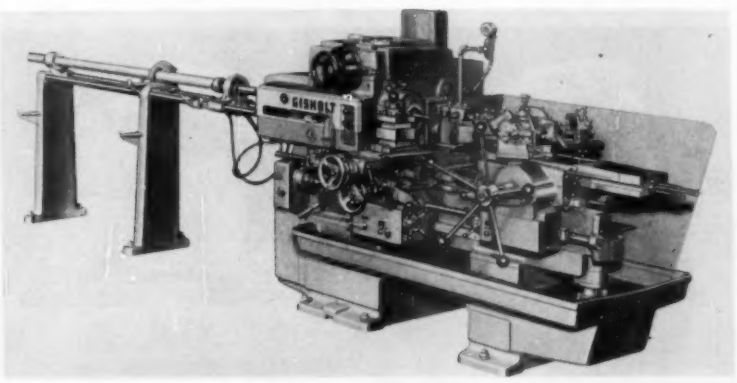
Masterline ram type universal turret lathes, available in three basic models, are built to provide fast, easy operation. High spindle speeds permit efficient use of modern cutting tools. Round bar stock capacity is 1½ in. for the No. 3 lathe, 2 in. for the No. 4 and either 2½ or 4½ in. for the No. 5 unit. All models can be equipped with the Gisholt JETracer, mounted on the rear of the cross slide or on a single turret face. The machine can also be furnished with a Lynn hydraulic drive unit to provide automatic operation.

Headstock permits transmitting up to 30 hp. The No. 3, No. 4, and the smaller capacity No. 5 machines have an 8-in. A-1 American Standard flanged spindle nose. The No. 5, 4½-in. capacity machine has an 11-in. nose. The No. 3 machine may be furnished with an 8 or 16-speed headstock. The 8-speed headstock offers a standard spindle speed range of 40 to 1500 rpm with a high range of 53 to 2000 rpm. The 16-speed No. 3, and the 16-speed Nos. 4 and 5, offer a standard speed range of 30 to 1500 rpm and a high range from 40 to 2000 rpm.

Spindle movement and control is by levers. An hydraulic speed selector permits choice of direct or preset operation. Speed shifts are accomplished in three seconds or less. A "high-low" trip lever offers an instantaneous 8:1 speed change between operations.

Swing over the ways for the three units ranges from 19½ to 21¾ in. Longitudinal travel ranges from 19⅛ to 25⅝; cross travel of the cross slide from 10 to 10½ in. The square turret is 5¼ in. wide on all machines and carries a ¾ x 1¼-in. size tool. Eight selective, reversible, power cross and longitudinal feeds are available to the universal side carriage ranging from 0.003 to 0.042 in. The turret ram is also provided with 8 power longitudinal feeds ranging from 0.003 to 0.042 in. Effective turning length for the hexagon turret is 10 in. for the No. 3, 12 in. for the No. 4, and 14 in. for both sizes of the No. 5. The No. 3 machine can swing a 12-in. chuck; the No. 4 and No. 5 machines can swing chucks with diameters up to 15 in.

Gisholt Machine Co., Madison 10, Wis. **T-7-1691**




## Electrical Discharge Machining Unit

This unit, which utilizes electrical discharges to machine metal, is capable of removing 1 cu in. of hardened metal in 15 minutes from a 35-sq-in. surface to give a 10-microinch, rms, finish. It will hold a tolerance of 0.0005 in. It is composed of an electronic rotary high-frequency generator and a conventional machine similar to a vertical



jig borer. Four working speeds (for roughing, semifinishing, finishing and microfinishing) can be selected by pushbutton, while another dial permits regulation from low to high intensity at any of the speeds. The 4½-kw machine incorporates a special circuit, permitting sharp spark discharge for faster work. Rate of discharge is maintained at a predetermined setting for accuracy, desired finish and machining speed. An electronic feeler controls a sensitive servomechanism that moves

NOBLE & STANTON
Standard
JIG & FIXTURE COMPONENTS
complete line—over 500 parts
"FIXTURES IN A JIFFY"

"T" ANGLE PLATES

Our "T" Angle Plates have many applications as milling fixtures, comparator stands or drill jigs. The addition of a few special parts make this a complete fixture at little cost. Normalized, precision-machined castings—7 standard sizes.



BOX JIGS



Standard's Box Jigs are made in either square or rectangular styles in 9 sizes. It will pay you to have them on hand in several sizes.

MILL FIXTURE BASES

Mill Fixture Bases are available in a variety of sizes. All are normalized and precision-machined. They are furnished with either standard keyways, or jig-bored holes for "Sure-Lock" Fixture Keys at no extra cost.







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WRITE FOR YOUR COPY
FREE CATALOG
illustrating our complete line of top quality jig and fixture parts.



AUTOMATION NOTE: Also Custom-Built Precision Parts for Automation Tooling. Ask us.

STANDARD PARTS CO.
1012 BROADWAY • BEDFORD, OHIO
INDICATE A-7-150

the tool in accordance with work progress to maintain a preset gap between tool and workpiece at all times. Work is mounted in an oil pan. A coolant pump circulates dielectric fluid to immerse the piece during operation and to remove chips as they are eroded. The tool head is fitted with a soft metal electrode formed in the pattern to be cut.

Abaco Industries, Inc., 78-21 Queens Blvd., Elmhurst, L. I., N. Y. **T-7-1501**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Self-Sealing Coupling

Fast-acting self-sealing hydraulic coupling locks with a simple push, and couples against 60 psi in both coupling halves without twisting, turning or special tools. There is no intermediate, or partially locked position. Simply pulling on the coupling disconnects the unit and provides positive seal for each half, yet high acceleration and impact loads will not cause accidental uncoupling.

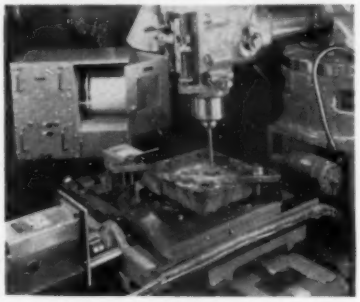
The disconnect meets both present and proposed military qualification tests for air-inclusion, oil loss and pressure drop. Operating sleeve stays in fully assembled position when subjected to repeated accelerations of 35g. Locking device and sealing elements are located internally.

The Weatherhead Co., Aviation Div., Antwerp, Ohio. **T-7-1502**

## Positioning Table

Lightweight, low-cost Binotrol automatic positioning table, particularly suitable for repetitive runs in light manufacturing and small machine shops, controls a 10 x 10-in. Master Model 12 table which is positioned along 2 axes to an accuracy of 0.001 in. Controls for the table are packaged in a 16¾ x 15⅝ x 10½-in. console.

Table control is by means of a punched tape system originally developed to control the Jones & Lamson No. 7 turret lathe. Its operation is automatic.



The table can be used in combination with any common machine tool for usual machine shop operations.

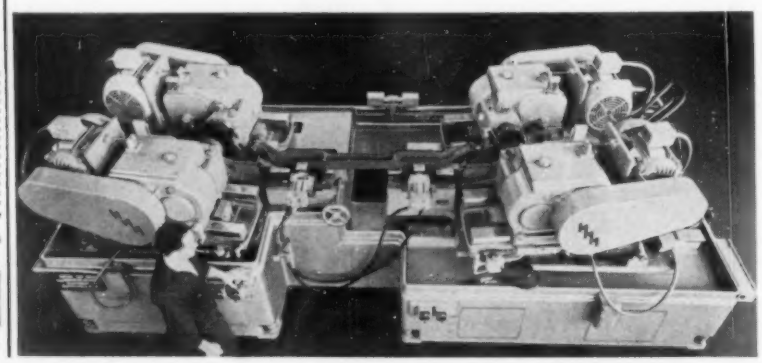
Future models of the table will incorporate printed circuitry. The same control system can be applied to a table of larger size, and signals may be fed into the machine manually as well as by punched tape.

Barnes Engineering Co., Stamford, Conn. **T-7-1503**

## Milling Machine

This double duplex milling machine utilizes two pairs of opposed milling heads to simultaneously mill from four sides the kingpin bosses of forged steel axles. Two surfaces on each end of the front axle are face milled in relation to the frame mounting surfaces.

Two tables on each side of the base are adjustable, so that various angles can be milled. The right-hand table is mounted on ways in order to adjust the distance between the pairs of milling heads. Each milling quill has a 2-in. adjustment. Fixturing is universal to



permit endwise equalizing and provide for variance in part design and size.

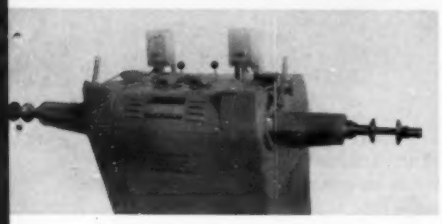
Hydraulic clamping is done when the cycle button is pressed. Except for loading and unloading the part by hoist, all machine movements are automatic. Control and actuation are by hydraulic power. The milling heads are of the universal type, heavy duty, single speed, with provision for speed changes by change gears.

This machine can be adapted to parts similar to the specific work for which it was designed by varying positions of the universal components which hold and machine the work.

The Motch & Merryweather Machinery Co., Machinery Mfg. Div., 888 E. 70th St., Cleveland 3, Ohio. **T-7-1511**

## Buffing, Polishing Lathe

A two-spindle variable-speed buffing and polishing lathe, Model VRROW, has a swing of 20 in. from side of base to face of inner flange. The two spindles operate independently, each having its own motor and variable-speed con-



trol. This permits each operator to change wheels or vary speeds without interfering with the other. Each wheel may be driven by a 5, 7½ or 10-hp motor. Spindle speeds can be changed while lathe is running.

Dept. 1661, Hammond Machinery Builders, Inc., Kalamazoo, Mich.
**T-7-1512**

## Press

A 75-ton automatic Flexopress is developed primarily to prolong die life.

Design incorporates a slide, with four preloaded ball-bearing raceways operating in hardened and ground steel inserts to maintain vertical accuracy within 0.0005 in. and parallelism between slide face and bed within 0.0015 in.

Operation up to 370 spm is possible because of low ram inertia resulting from lightweight aluminum-alloy construction, antifriction bearings and double air cylinder counterbalancing.

A 15-in. side opening accommodates work up to 14 in. wide. Automatic feed





Those who buy tools for lasting performance as well as initial appearance always specify "Nelco". These carbide tipped Milling Cutters are precision built for rugged dependability, engineered to "take it"—singly or in gangs—to save *real money*, deliver fast and accurate results without the operational and maintenance "headaches" of most conventional cutters. Look for benefits *and* appearance—call for Nelco—your distributor has the size and type you need in stock.

*SEND TODAY for 24 page manual—"Suggestions for Operating and Maintaining NELCO TOOLS!" Contains illustrated instructions for regrinding with operating charts and data.*



NELCO TOOLS — *For that EXTRA Edge in Production!*

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-151

# Zagar Tools

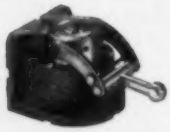
## HOLD YOUR WORK—AND YOUR BUSINESS!



Collet indexing fixture



Collet holding fixture

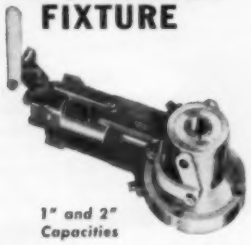


Vertical-horizontal collet fixture

## ZAGAR HOLDING and INDEXING FIXTURES

Zagar fixtures offer you a most inexpensive way to machine small parts. Set-up is speeded and much special tooling eliminated. Slot milling, straddle milling, drilling, tapping and grinding of small pieces can be done most profitably with Zagar fixtures, *available from stock.*

## AIR-OPERATED FIXTURE



1" and 2" Capacities

Manual or mechanical control is optional on the "Air-O." The cam or chain can be readily connected. Solenoid operation is possible for the valve control. Parts are interchangeable. For out-speeds hand operation.

## COLLET LATHE CHUCKS



1" and 2" Capacities

Zagar chucks are easily adapted to any make of lathe, grinder or rotating spindle. Handles bar stock—lengthwise, with no movement. Speeds loading and unloading. Can be opened and closed while machine is running.



## COLLETS, PADS, BLANKS

Five types: No. 310 Zagar Master; Nos. 2 and 6 W. & S.; No. 5-C; No. 6 W. & S. pads. All but Zagar No. 310 are standard machine tool sizes. All collets are made of oil-hardened tool steel; have flat tops for locating purposes.

*Write for Engineering Sheets "E-7" on each product.*

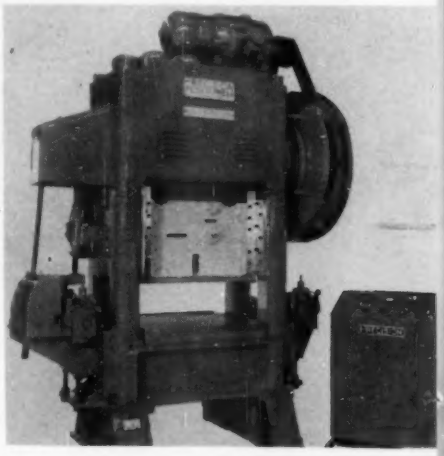
**ZAGAR, INC.**
**23892 LAKELAND BLVD.**
**CLEVELAND 23, OHIO**

Zagar TOOLS For INDUSTRY and SPECIAL MACHINERY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-152


is infinitely adjustable up to 8 in. per stroke. The slide face measures 32 in. wide and 18 in. deep with a 2-in. diameter hole and a single knockout. The 4-in. thick bolster, 36 inches wide and 30 in. deep, is removable. Stroke is 2½ in. With slide in down position, maximum distance between slide face and bolster is 10 in.

Double feed rolls have 360-deg cam lifters. Distance from center line of the rolls to top of the bolster is adjustable from 4 to 5 in. and drive gear teeth



are always on pitch center regardless of the material thickness. A scrap cutter is mounted integral with the feed rolls.

The electric control can be installed in a console, a pendant or a machine-mounted panel. The control provides single-stroke, continuous operation, inching, variable top stop control, variable sequence inch control, key locking, motor reverse, motor start, emergency stop, variable motor speed, key locking stroke counter and a visible tachometer.

Precision Welder & Flexopress Corp., Cincinnati, Ohio. **T-7-1521**

## Torque Limiting Attachment

An attachment for drilling machines, turret lathes and boring machines incorporates a preset torque limiting arrangement. Design of the attachment permits easy, rapid interchange of drilling or boring tools for operation in any metal.

Tapping torque is automatically predetermined for tapping within capacity of the attachment according to type and size of the tap. However, the torque will slip when bottoming or in abnormal conditions to protect work and equipment. Speeds for operation are limited only by the quality of the tool

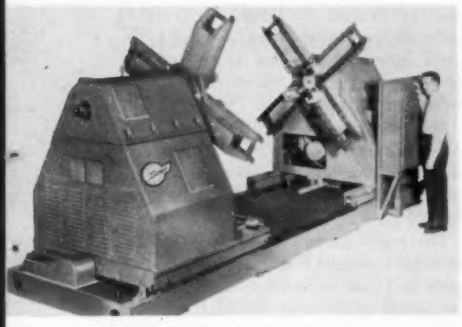
used and the material being machined. Because the attachment is made with virtually no moving parts, maintenance is simplified.

Distributed by Federal Machinery Sales Co., 4639 Washington Blvd., Chicago 44, Ill. **T-7-1531**

## Coil Handler

Heavy-duty, power-driven, Twin-in-Action coil handler is designed to carry heavy coil loads of either steel or aluminum. It can be built to meet customer specifications, and to handle coil weights up to 40,000 lb.

The coil is picked up on the ID by 4 radial, contoured, power-driven expander arms, without harming any portion of the coil. The arms are positively operated in unison. Construction and design of the expander arms permit trouble-free, easy loading. The twin



reels are power-driven and synchronized to carry an equal part of the load.

Each reel can be laterally adjusted, independently or in unison, to provide easy alignment with the press or die.

Uncoiling of stock is started by pressing a button; stock flow is governed by a simple electrically operated loop control.

Sesco Inc., 8881 Central Ave., Detroit 4, Mich. **T-7-1532**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Automatic Die Sinker

This automatic bed type die sinker, constructed of solid cast iron and reinforced to handle the heaviest cuts accurately, is equipped with a magnetic tracer and can be operated in three different ways. In addition to working as an automatic die sinker, it can be used as either a power-operated or a hand-operated straight milling machine. When on fully automatic operation the


# MARVEL *Synclinal* FILTERS




## Answer DESIGNERS S.O.S.

For Dependable Protection on All Hydraulic and Low Pressure Systems

Simple, Balanced Design . . . is the answer to the growing preference for MARVEL Synclinal FILTERS. Designers are specifying Marvel Synclinal Filters to assure minimum maintenance and maximum protection. Results show Marvel Synclinal Filter superiority in maintaining the greatest degree of cleanliness of liquids in all hydraulic and low pressure systems with minimum downtime. Furthermore, when filter servicing is necessary, Marvels can be easily disassembled, cleaned and reassembled by any workman in a matter of minutes. Line types operate in any position and may be serviced without disturbing pipe connections. Again and again, Marvel Synclinal Filters have demonstrated they meet all requirements of the most exacting users, that today—OVER 650 ORIGINAL EQUIPMENT MANUFACTURERS install Marvel Synclinal Filters as standard equipment.

**A SIZE FOR EVERY NEED**

Available for sump or line installation in capacities from 5 to 100 GPM. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

**IMMEDIATE DELIVERY**

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

**FILTERS FOR FIRE-RESISTANT HYDRAULIC FLUIDS**

Marvel's most recent development is a filter for the efficient filtration of all types of fire-resistant hydraulic fluids.

**WATER FILTERS**

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.




Catalogs containing complete data available on request

**MARVEL ENGINEERING COMPANY**

7227 N. Hamlin Ave., Chicago 45, Ill.

Phone: JUNIPER 8-6023

Without obligation, please send me complete data on Marvel Synclinal Filters, as indicated:—

☐ Catalog No. 107—For Hydraulic Oils, Coolants and Lubricants

☐ Catalog No. 301—For WATER

Data on Filters for Fire-resistant fluids—

☐ AQUEOUS ☐ SYNTHETIC

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Company ----------

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City ---------- State ----------

# WALES hole-punching UNITS

"Boosted our profits, cut time"



"I found that out; but quick!"



"WALES Engineers showed me how simple the WALES UNIT really is. Punches can be removed and replaced in holders in a jiffy! No special tools needed. No aligning necessary. Little or no 'down time'!

"I had a production run of stainless steel flat pieces 24" x 18", (⅛") .125 thick. Called for 14 holes and 2 notches in every piece . . . and they were needed FAST. Ordinarily took about three quarters of an hour to set-up and roll.



"The WALES-WAY banished my worries. Punches and dies automatically aligned. Punches, stripping guides, springs and guide buttons are not attached to press ram. They're all components of the WALES UNIT. It's all done in minutes . . . not hours."



WALES-WAY Punching UNITS are made for a great many uses. One adjustment of the ram for all sizes and forms. The UNITS have a uniform shut height punch from shim stock to ¾" plate. Use the same UNITS over and over with different patterns. There's no dead storage of set-ups and no heavy investment. Your shop can really compete in both price and quality . . . and speed.

WALES self-contained UNITS are available in infinite sizes and styles . . . from stock



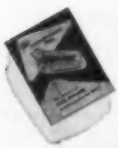
HL Punching Units and NA Notching Units set in place on Templet

Punching and Notching Units with work piece in place

Finished work pieces showing 14 punch holes and 2 notches

**OUR ENGINEERING STAFF WILL ASSIST YOU WITHOUT CHARGE**

Tell us about your shop problems in punching, notching, etc. We have case histories galore that should be worth your while to check.



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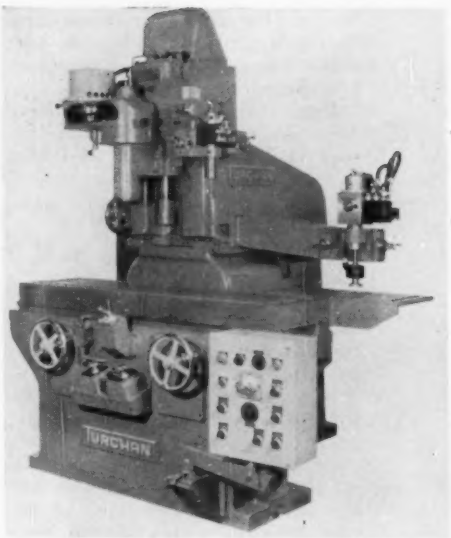
Gives you the complete story of the WALES-WAY Punching UNITS. How they cut costs . . . speed up work . . . increase your profits.

**WALES Strippit CORPORATION**

**"...the Wales-Way is the PLUS-PROFIT way"**

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WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

operator can set the length of stroke to cover the workpiece and select the desired index or pickfeed at the end of the cut. A second tracer control can be used for contouring.

Automatic reciprocating feeds and index are interchangeable with ram and table and can be changed to hand control by turning the central knob on the control panel.

The tracer automatically coordinates vertical movement of the cutter with table and ram movements to reproduce the profile of the master model; electric limit switches control length of stroke on table and ram.

Turchan Follower Machine Co., 8259 Livernois Ave., Detroit 4, Mich.

**T-7-1541**

## Flow Control Valves

A line of Quick-Dump flow control valves is designed to utilize a single basic valve body which may be used either normally open or normally closed, depending upon port connections. A variety of simple devices may be added to the standardized valve body for triggering the valve action.

Seven models are available: solenoid, cam-operated, palm button, finger-tip,



foot-operated and two types with hand levers. Opening, closing and holding action of the valves are effected by the pressure of the air or liquid. Valving action works with the pressure instead of against it. Shutoff is sure and positive. Cycling is rapid. Capacity is large (full ¼-in. internal ports), yet the valve body is compact. As a result of simple construction, there are no internal packings, springs, or pistons, and no sliding of metal-to-metal contacts. It is adapted for applications up to 125 psi and under temperature variations from -40 to 225 F.

A momentary electric impulse triggers the valve to "open" or "close" positions. No current is required to "hold" since there is no prolonged flow of current. There is no danger of overheating the coil.

Humphrey Products, subsidiary of General Gas Light Co., Kalamazoo, Mich. **T-7-1551**

## Grinding Attachment

Automatic infeed attachment, called Feedcision, for precision, high-production centerless grinding has been designed to avoid variables. An adjustable position positive stop, controlling a single setscrew, removes grinding stock from 0.005 to as much as 0.040 in. in one pass.

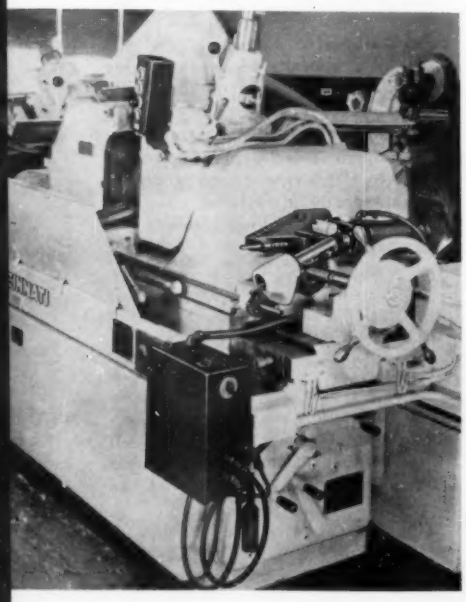
The unit is designed so that an operator's hands need not be near the grinding wheels during operation. Warning lights show when the unit is in setup position and while it is in the grinding cycle.

To save materials when grinding small diameters, the unit is designed to open only 0.007 so that small diameter workpieces cannot get caught between regulating wheel and work blade.

Simple to operate, the attachment provides automatic adjustable feed control infeed and adjustable spark out timing. The operator only inserts the workpiece and starts the equipment.

The Feedcision is easy to install on any new or old centerless grinder.

Modern Devices, Box 429, Libertyville, Ill. **T-7-1552**



## Universal Cylinder Mountings

Two types of universal cylinder mountings have been developed primarily to maintain alignment between cylinders and their loads.

One type is a hinge mount cylinder (illustrated) with universal mounting brackets at each end; the second has universal trunnion and universal mounting bracket for the rod end.


# Free Technical Bulletin on Surface Measurement

gives all the meat of ASA Standard B46.1-1955 on surface roughness, waviness and lay, plus helpful supplementary material. Arranged for easy reading and convenient reference. Includes these sections:

- Basic definitions — with profile records of typical surfaces.
- How to designate the characteristics of roughness, waviness and lay, on drawings.
- How to measure those characteristics.
- Arithmetical and r.m.s. average roughness height.
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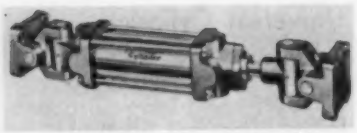
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MMC MICROMETRICAL MANUFACTURING COMPANY

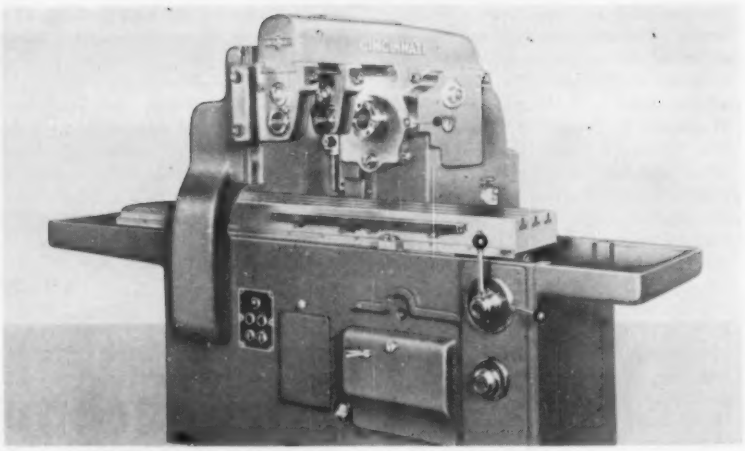
349 S. MAIN ST. ANN ARBOR, MICHIGAN

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Common applications for these cylinders include operation of hopper gates, elements rotating about shafts such as gear segments and levers, and objects moving on wheels or tracks. They also compensate for deflection and misalignment where cylinders are connected to structures that are riveted, bolted or welded together.

Hanna Engineering Works, 1765 N. Elston Ave., Chicago 22, Ill. **T-7-1561**



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## Milling Machines

Powermatics Series 200, automatic milling machines, designed for high production plus convenience and simplified setup, are built in plain, duplex, and plain rise-and-fall styles. Heavier and more powerful than previous models, the new units offer cutting capacity up to 10 hp and spindle speeds up to 3000 rpm for taking conventional or climbing cuts with either high-speed steel or sintered carbide milling cutters.

They are built in seven sizes of each style, from No. 205-112 (24-in. table travel, 5 hp) to 210-118 (96-in. table travel, 10 hp).

Through a cycle selector unit (which is an assembly of cams), a single lever initiates complete, automatic milling operation, including: table cycle, spindle stop, backlash eliminator, spindle carrier cycle of R&F machines, and automatic spindle retraction when this equipment is supplied. Dogs control length of stroke only. Users may maintain an inventory of cycle selectors to meet varying setups. Changes require less than a minute of time.

Table ways are automatically pressure lubricated with filtered oil, and protected against grit and coolant. Feed trip dogs are carried on the underside of a rail attached to the front of the table, where they will not be fouled with chips. The table is traversed through a conventional screw and nut arrangement, and powered by a separate 2-hp motor mounted on hinged rails in the bed.

Standard automatic table cycles feed to the right or left, or alternately right and left with a center stop position for safety. Rapid traverse is at the rate of 300 ipm. Sixteen table feeds, ranging from ½ to 20 ipm are obtained with change gears.

Sixteen spindle speeds in 3 ranges are available; 75 to 3000 rpm, 50 to 2000 and 30 to 12000 rpm. Speed range and horsepower are interrelated.

The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. **T-7-1562**


SYNTRON

Vibrating

LAPPING POLISHING MACHINES




- Automatic, high-speed lapping and polishing of parts, samples, etc.
- Produce perfect metallographic finishes in one-third the time.
- Eliminate use of expensive polishing wheels—practically no rejects.

of proven dependable Quality

New Syntron Lapping-Polishing Machines are completely automatic. Driven by variable controlled electromagnets, they assure a positive, even polishing action on practically any part or sample where microscopic finishes are required. No expensive installation or grinding equipment required.

*Write for Catalog Data—*

SYNTRON COMPANY

340 Lexington Ave. Homer City, Pa.

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## Blast Cleaning Unit

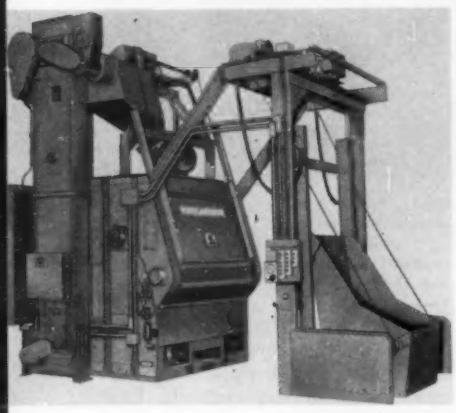
Batch type airless abrasive blast cleaning machine, designed for economical blast cleaning efficiency, has an operating load capacity of 28 cu ft. It will clean sand, scale, oxides, and other contaminants from any work that can withstand a tumbling action.

The unit, called Super Tumblast, is engineered for high productivity and maintenance-free operation over ex-

tended periods of time. It may be operated automatically or manually.

For fast cleaning, this airless unit throws 830 lb of abrasive per minute, employing only one abrasive hurling wheel. The abrasive shower spreads over the cleaning chamber in a uniform manner.

Perhaps the greatest single cost saver in this machine is its separator. Using the air separation principle, it has three times the separation surface found in



older machine designs for similar loads. Every pellet thrown is effective metal shot or grit. The optimum abrasive mixture is maintained throughout the blast cycle.

The power-operated door prevents abrasive from escaping the machine. It will withstand impacts from both inside and outside. It travels in tracks that are integral with the side frames of the machine. All high wear points are protected by Long-Lyfe liners of a special heat-treated alloy steel that lasts 25 to 50 times as long as ordinary standard liners.

Design features of the unit make it particularly adaptable to automatic operation. A single pushbutton will actuate entire sequence from loading to unloading.

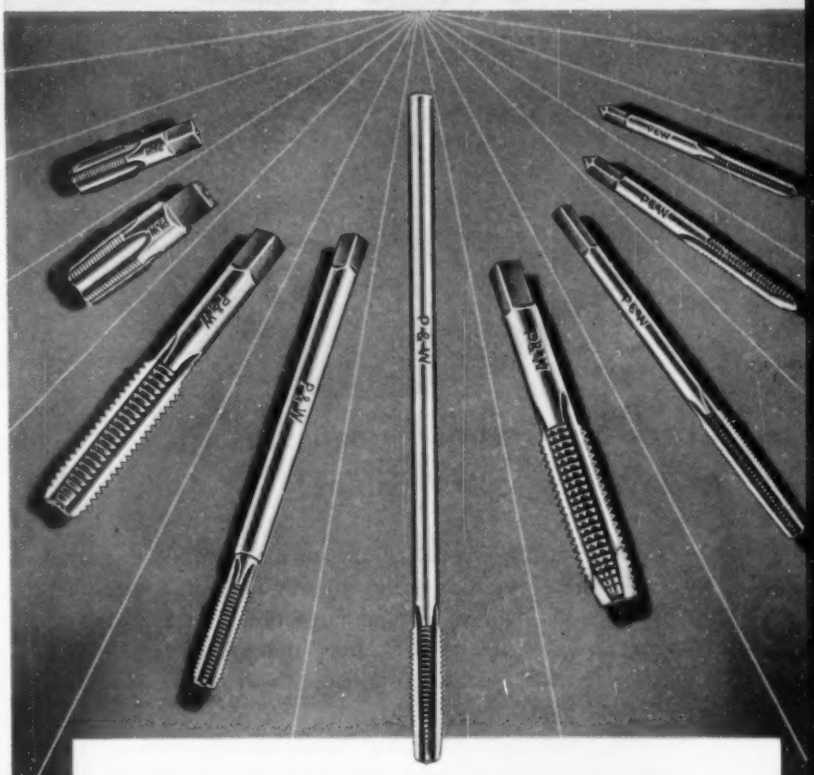
Wheelabrator Corp., Mishawaka, Ind.
**T-7-1571**

## Tapping Head

Adjustable-clutch tapping head, called Tap-Saver, regulates driving torque automatically according to the hardness of material, and type and size of tap, after a simple dial setting is made. It offers thread accuracy and good finish plus high output per tool, while tap breakage is minimized.

Threads cannot be forced or "chattered" when the spindle is withdrawn as it elevates slightly ahead of the tap so that the tap leaves the hole by


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*Quality* TAPS
for the long run . . .
because they run longer!



Next time you're figuring tooling costs, remember it's not the purchase price that's most important. It's what you get for your money . . . the number of clean, accurate threaded holes each tap delivers on the production line!

Correctly designed, carefully manufactured and rigidly inspected, *every* Pratt & Whitney Tap you buy has the same high quality. There is a complete line for all your needs . . . available from on-the-shelf stock at Pratt & Whitney Branches everywhere.

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Check Motions or Dimensions
In .001" up to 10" Range.

Ames Long Range Dial Indicators in a variety of models are made for quality control applications requiring close tolerance and inspection. For example, you can measure in .001", long slide travel, large cams, deep recesses or other dimensions requiring indicator spindle travel of up to 10".

In addition, Ames Long Range models have all the advantages that are built into Ames regular indicators:— dials of large diameter; easy-to-read, widely spaced graduations; movable dials; replaceable contacts. All Ames Long Range indicators have count hands to indicate revolutions of the indicator hand. Those with box covered, rack guide have a slot in the cover graduated to register each inch of spindle movement.

Write today, sending your problem in long range measuring. Ames will be glad to suggest a solution. Be sure to include drawings and specifications — your answer will be back faster if you do.



*Representatives in principal cities*

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*30 Ames Street, Waltham 54, Mass.*

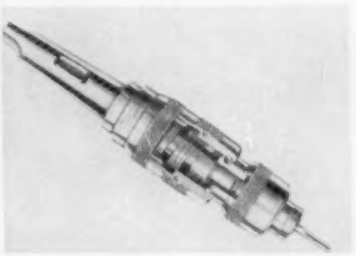
MANUFACTURER OF MICROMETER DIAL GAUGES • MICROMETER DIAL INDICATORS

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spring retraction, avoiding damage to the starting threads.

It can be used for drilling, reaming, spot facing and counterboring, as well as right or left-hand tapping. A quick-change chuck permits rapid tool changes for different operations, using special tap and drill collets which are a part of the set.

A series of operations can be performed in sequence without repositioning the machine spindle or the work. Only collet and tool are changed.



The Davis Tap-Saver head is available in three standard sizes to accommodate Morse taper shank drill collet numbers 2, 3 and 4, respectively. Each head is supplied with three drill collets and seven assorted collets for right or left-hand taps. Each size set accommodates ½ through 2-in. diam taps.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. **T-7-1581**

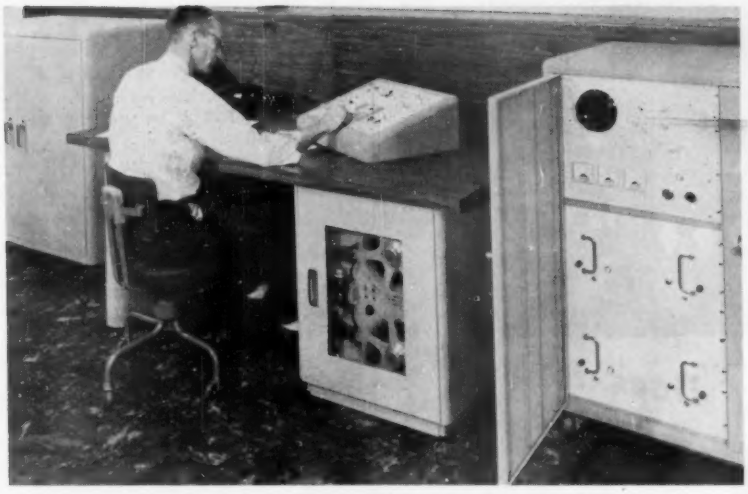
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## Tape Control

A numerical control device, called Digimatic, is used for operating complex machine tools by means of digital instructions that are automatically computed and recorded on magnetic tape.

Digimatic has two main units: a planning desk, the main parts of which are a high-speed decimal computer and a tape recorder; and a machine control unit which governs operation of a machine tool by instructions on magnetic tape.

Dimensions of a finished part are first fed into the planning desk in sequence, through a keyboard similar to that of an adding machine. After each dimension has entered into the keyboard, the operator presses a "compute" button. The computer converts the dimensional data into proper numerical instructions, which is simultaneously recorded in pulse form on the magnetic tape. Computation takes less than a minute for most dimensions. An indicator lamp flashes on when the computer is pre-



**Computer in cabinet, at left, interpolates dimensional information into pulse signals recorded on magnetic tape. Cabinet at right contains power supply for all units of planning desk. Operator enters dimensions of part to be produced into Digimatic planning desk at the center.**

pared for the next dimension.

The computer also checks itself, and flashes a warning light if it makes an error.

The Digimatic can compute and record the proper instructions for milling true curves as well as straight lines. Simply setting two dials on the keyboard instructs computer to produce either straight lines or curves and, if the latter, in which direction.

Tape containing the instructions is rewound and played back to the machine control unit. An operator is needed only to clamp the blank in the fixture, and insert a tool in the spindle.

Servomotors on the milling machine, obeying the tape-recorded instructions, complete the piece automatically. If the machine deviates from instructions, transducers signal the electronic control unit, which then produces the proper corrective instruction. Digimatic is accurate to 0.001 in.

Electronics Control Systems, Inc. Affiliate of Stromberg-Carlson, Div. of General Dynamics Corp., 2136-38 Westwood Blvd., Los Angeles, Calif. **T-7-1591**

## Automatic Testing Machine

This automatic relaxation tester maintains a fixed extension or strain when testing at elevated temperatures.

When in use, a specimen is inserted in a circular testing furnace mounted between the crossheads. The furnace temperatures are controlled up to 2000 F by a separate unit adjacent to the machine.

A predetermined extension in in./in. is selected, and the machine started at the desired loading speed. Load is applied to the specimen until the fixed extension is attained. As the specimen tends to strain further under the influence of increasing temperature and load, the amount of load is automatically reduced to maintain the fixed extension. All variations of the test are recorded automatically by the XY electronic recorder mounted with all other controls on the machine face.

Tinius Olsen Testing Machine Co., 5381 Easton Rd., Willow Grove, Pa. **T-7-1592**

## Steel Roller

Woehr-Roller-Leveller, Model 11-F, flattens mild, hard-tempered and stainless steel, as well as aluminum, brass, or copper. Rigid specifications can be met with widths up to 42 in. and gages from 0.020 to 0.093 in.

It straightens sheet and coil stock,



produces cut length flat sheet from coil and work-anneals deep drawing steel.

This machine operates at a standard speed of 56 fpm. A single sprocket change can increase or decrease standard speed as required. Power source for the roller-leveller is a gear-head, single-speed motor (or an optional variable-speed drive), which is readily accessible for easy maintenance. Manually controlled reversing drum switch and motor cutout switch, with thermal overload protection, are standard equipment. One-man operation is safe and efficient.

All eleven straightening rolls and the two feed rolls run in roller bearings, and all except the top feed roll are power driven by a closed gearbox. Bronze bearings in the gearbox are constantly lubricated by oil which is retained in the box itself. All other working parts are lubricated through pressure grease fittings.

F. A. Woehr Machine Co., 17 Favor St., Rochester 8, N. Y. **T-7-1593**

## Rotary Limit Switch

Nine-point mechanical rotary limit switch, simple in design and operation, can be used for automatic machine operations or sequencing. It may be used on any make of press to control starting, stopping and interlocking of motion, time, sequence and recycling



of press auxiliary equipment. It is also useful on other types of machines.

The switch operates at various speeds, and is especially useful in control of rapid operations requiring split-second timing.

Each of the 9 control stations on the face of the switch can be independently set from the front through the complete range of 0 to 360 deg. Switches are actuated by a single rotating helical cam. Each switch is independent of the others, although they may all be set to make or break at the same instant.

Timing is precise and each station can be preset to within 1 deg; final microadjustment reduces this error to less than ¼ deg of arc. Once set, the dials can be positively locked to pre-

STOP PIPE THREAD LEAKS with



TRU-O-SEAL
TEFLON SEAL

Does away with messy pipe "dope" compounds!

PAT. PENDING

. . . Eliminates valve and pump damage caused by overtightening of leaky joints.



. . . "TEFLON" SEAL is immune to ALL hydraulic fluids and to steam, air, water, solvents and practically all gases and chemicals!

. . . Withstands temperatures from —100° F. to plus 500° F.!

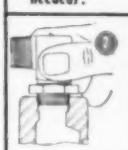
. . . *Fully field tested and proven by leading manufacturers!*

EASY INSTALLATION!

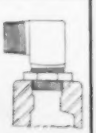
1 Thread TRU-O-SEAL on pipe or fitting (no messy pipe "dope" needed).




2 Thread pipe or fitting 4 threads into port. Point in desired direction.



3 Tighten TRU-O-SEAL to complete leakproof assembly (only light torque required).



TRU-O-SEAL stops present pipe thread leaks instantly, prevents future leaks, saves cost and labor of special or welded fittings. For 3000 psi operation (15,000 psi minimum proof pressure). Comes in ⅛" to 2½" pipe thread sizes.

*Write for Prices and Complete Data*

TRU-O-SEAL DIVISION
*Flick Reedy Corporation*

2010 N. Hawthorne Ave. Melrose Park, Ill.

*"Miller Fluid Power" is also a division of Flick-Reedy Corp.*

FOR FURTHER INFORMATION. USE READER SERVICE CARD; INDICATE A-7-160

vent drifting from original settings.

A four-point model of the Automation Limit Switch is also available. Both are single-pole, double-throw types. Either model can be ganged on a single shaft.

E. W. Bliss Co., Canton 10, Ohio.

**T-7-1601**

## Lead Comparator

Bench model lead comparator, capable of measuring the lead of threads in large diameters and long lengths, offers simplicity of operation to permit unskilled workers to obtain accurate dial readings when inspecting lead of worms, gages, bolts, taps, lead screws, etc. The comparator also may be used



to check the spacing of holes, grooves, notches, etc. It is accurate to within 0.0001 in.

It inspects threads with the driving dog on the work and requires no adjustment to centralize with the center line of the workpiece.

Standard bench model SK-1003 has a thread diameter range of from 0.112 to 2 in. Other sizes and capacities are available on special order.

Accessories consist of a master for reference settings and extra contact points.

Jerpbak-Bayless Co., Solon, Ohio.

**T-7-1602**

## Insert Chaser Die Head

This single die head, designed for use on No. 2 B & S automatic screw machine, may be used for straight, regular taper or reverse taper threads with only a few minutes changeover.

A trip plunger cam is used to produce the desired thread.

The die head is so designed that on cutting straight threads the carriers are held in a constant position. On cutting regular taper threads, carriers are cammed for a receding action. For reverse taper threads, carriers are cammed for a closing action.

Straight thread capacity ranges from

Miller

# FLUID PRESSURE BOOSTERS



## BOOST 80 PSI AIR

**Input Range: 40 to 3000 psi Air or Fluid**

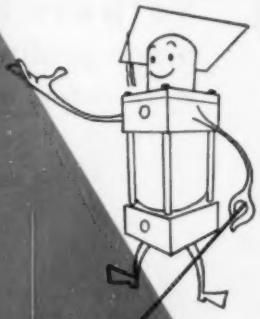
## TO 2000 PSI HYDRAULIC PRESSURE

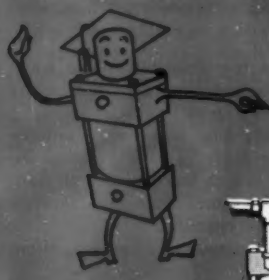
**Output Range: 200 to 10,000 psi Fluid**

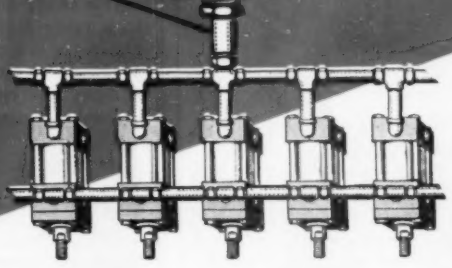


- Save space, weight and investment cost by replacing pump installations in many applications
- Less costly to install, operate and maintain
- **Hold pressure indefinitely** without the motion and heat generation of ordinary pump circuits
- Provide—at point of cylinder thrust—more efficient power with less weight in less space than direct driven air cylinders
- Save up to 95% of air consumed by direct driven air cylinders
- Operate at speeds of 30 to 450 strokes per minute

NOTE: In addition to its most complete line of "Custom-Built" Boosters available on normal delivery, Miller offers 5" bore, 25 to 1 ratio boosters for immediate delivery in either 6" or 12" stroke. Write for data and prices.







## ESPECIALLY RECOMMENDED FOR

- **WELDING**
- **PUNCHING**
- **SHEARING**
- **CLAMPING**
- **RIVETING**
- **CRIMPING**
- **PRESSING**

***and similar applications***




**FULL DETAILS IN MILLER BULLETIN B-200 SENT FREE ON REQUEST**
**Other Miller products include: Air cylinders, 1½" to 20" Bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.**

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Miller

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BLICK-BEEBY CORP.

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COUNTERBALANCE CYLINDERS

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Let these mechanical helpers bring you more profitable results.

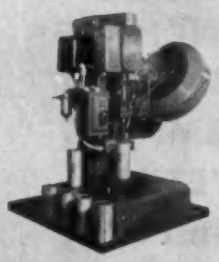
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**BOWL FEEDER**
Vibratory type, to select and feed smaller fragile parts.



**BARREL FEEDER**
with stationary ring cover, for heavy-duty, large production runs



**SPECIAL ASSEMBLING MACHINES**
For light assembly operations using Selective Parts Feeders to feed component parts



**BARREL FEEDER**
Conventional type, for parts requiring critical selection

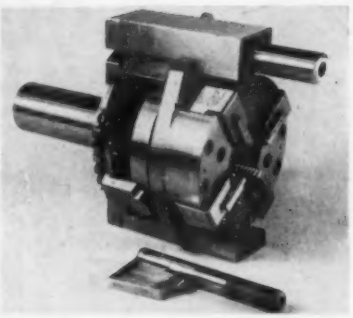


**5 SCREWDRIVING MACHINES**
Bench and Pedestal types. Pedestal Model A pictured

**DETROIT POWER SCREWDRIVER CO.**

2799-A W. FORT ST. DETROIT 16, MICH.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-162

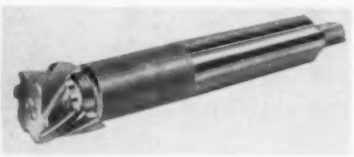



¾ to 4 in. long. Carrier range is from 0 to 1 in. Pipe from ⅛ to ¾ in. can be accommodated.

The Eastern Machine Screw Corp., New Haven, Conn. **T-7-1621**

## Reamers with Interchangeable Heads

These reamers are designed so that only the quickly installed head need be replaced because of wear or change in work. The head has a tapered hole to insure concentricity, and a special thread design to assure snug fit on the smoothly ground tapered shank. Reamer operates free from binding or sticking because the cutting portion wears undersize and creates negative relief.



Interchangeable heads are available in a range from ½ to 2¾ inches inclusive, in 1/16-inch increments with right or left-hand spiral flutes for through or blind hole reaming.

Tomkins-Johnson Co., Jackson, Mich. **T-7-1622**

## Lathe Attachment

This precision boring, turning and facing attachment is designed for use on any standard lathe for high-speed, semiautomatic production. Essentially, the Exactomatic attachment is a toolholder mounted on long, hardened, precision-ground ways and equipped with both pneumatic and hydraulic action. Adjustable stops control length of cut and depth of bore. Feed rate is infinitely adjustable.

Once set up for production, the device is operated by a single push-button switch which starts the cycle. Two general-purpose precision toolholders



and a dial indicator are provided as standard equipment.

Tool carriage has micrometer adjustment which, in conjunction with a precision spindle, permits tolerances of 0.0002 in. or less and holds taper to zero. Multiple-drilled toolholder plate provides for mounting of multiple tooling. Angular cuts may be made at high production speeds simply by mounting the unit at the desired angle. Various models and strokes are available including compound units which will bore and face simultaneously. The attachment can be mounted on a milling machine for semiautomatic milling and slotting.

Exact Level & Tool Mfg. Co. Inc., High Bridge, N. J. **T-7-1631**

head of the instrument shows when the indenter is in contact with the work, and a red light indicates when load cycle is complete.

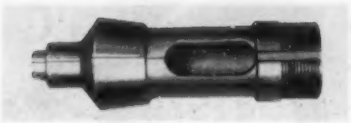
Vertical capacity is 2⅜ in.; maximum spread of standard vise jaws is 1 1⁄16 in. Surface finishes of 40 microinches, rms or less can be inspected, and indentations of 0.0004 in. or smaller can be measured to within an accuracy of 0.00008 in. The spot to be indented can be located to within 0.0002 in.

When the instrument is used as a metallurgical microscope, interchangeable objective lenses provide magnifications of 200X and 400X. A camera can be attached to the eyepiece for making photomicrographs.

The Sheffield Corp., Dayton, Ohio. **T-7-1632**

## Machinable Mandrels

A line of machinable expanding mandrels can grip in a hole as small as ⅛ inch. The one-piece mandrel, called Erickson Expanding-Collet, acts as a reversed collet, gripping the workpiece on the inside surface. By inserting the Expanding-Collet, a machine can be converted to internal chucking. Gripping power is equal to a collet, and release is as easy as a collet of the same style. These parts are machined to size on the customer's equipment. Thus, multiple mandrel sizes can be obtained from one basic size of Expanding-Collet. One-piece construction maintains maximum wall thickness since no drawpin is required.



Erickson Tool Co., E. 23rd and Hamilton Ave., Cleveland 14, Ohio. **T-7-1633**

## Micrometer-Stop Driver

This micrometer-stop driver permits accurate use of standard, economical stub taper combined drill and countersinks commonly used in aircraft work and on the center holes of all kinds of shafts.

In operation, the adjustable sleeve of the driver contacts the work first. The combined drill and countersink is then fed against light spring pressure until

## Micro-Hardness Tester

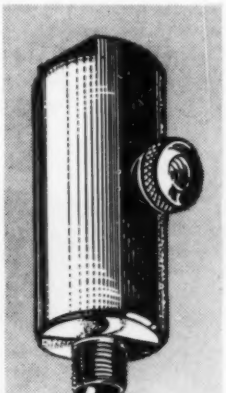
Combination nondestructive Micro-Hardness tester and metallurgical microscope, with a load-weight range of from 25 to 1000 grams, requires only one minute for a complete test cycle.

Interchangeable vise accessories permit its use for testing small precision ground or lapped parts, small diameter wires, thin materials or material coatings, thin sheet stock, cutting tool edges and ball bearings.

Fast and easy to operate, it requires no special skills. A green light in the





*Pity the poor worker who must fight the splash and slop of cutting oils.*

**HE REALLY HAS SOMETHING TO BE UNHAPPY ABOUT!**

And . . . an unhappy worker is a poor worker . . . an unsafe worker. And — oily floors breed accidents . . . work stoppages . . . insurance claims.

**END SPLASHING — AND . . . REALLY COOL WORK AND TOOLS —**

with an AMERICAN AERATOR which introduces air from shop air lines right into your coolant line, forming millions of tiny cooling bubbles that cling to work and tools . . . AND — greatly increase effective heat transmission area.

An **AMERICAN AERATOR** is a single, compact unit that has —

— a built-in regulator
— no filter or gadget to catch chips or impede flow
— "Thru-Hole" construction — same size as coolant line.

| Order Now — from stock — sizes as follows: | Pipe Size | Model | Price |
|---|---|---|---|
| | 3/8" | T-10 | $14.50 |
| | 1/2" | T-20 | $15.00 |
| | 3/4" | T-30 | $17.00 |
| | 1" | T-40 | $17.50 |

SPECIAL SIZES AVAILABLE

**AMERICAN AERATOR CO., INC.** 36 E. 13TH STREET, PATERSON, NEW JERSEY

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**. . . and you can change your method of cylindrical grinding to obtain MICRO-FINISH with POSITIVE ROUNDNESS!**

The RED-E new grinding concept is so graphically an improvement over conventional methods that even the 'die-hards' are changing over. Old-timers throughout the country have convincing proof that chatter, wheel-marks, out-of-roundness and costly secondary operations can be eliminated and controlled . . . that roundness is only as accurate as the Center hole alignment. With RED-E they now achieve super-finishes in cylindrical grinding!

Send for the new RED-E Concept Booklet! It explains how you can obtain the ultimate in grinding accuracies to within less than 50 millionths (0.000050") t.i.r.




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Gentlemen:
Please rush ( ) copies of your Concept Booklet.
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the feed is stopped positively at a depth that can be preset in 0.001-in. increments by adjusting the driver sleeve.

This adaptation of Cogsdill's Micro-Limit antifriction bearing driver is available with straight or taper shank, and can be used in drill presses, lathes or hand drills.

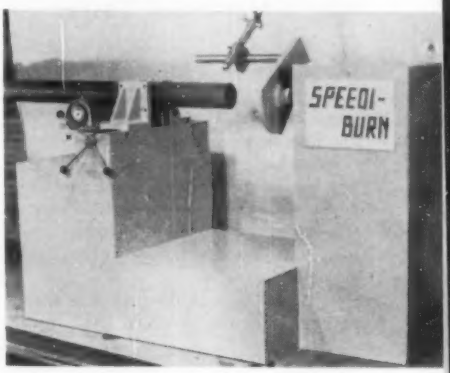
Cogsdill Twist Drill Co., 12980 W. Eight Mile Rd., Detroit 21, Mich.

**T-7-1641**

## Flame Cutoff Machine

This flame cutoff machine performs straight cutoff and beveling operations on medium and large diameter bar stock and pipe.

For pipe cutoff operations, the torch is mounted radially, and in operation, describes a complete revolution about the work. For bar stock cutting, a secant action of the torch is used, with the torch head describing only part of a




revolution. Built-in safety limit switches stop rotation of the torch head at completion of the cut.

Pressure piping may be beveled with machine accuracy and uniformity on this cutoff machine. To permit this operation, the torch is mounted in an adjustable angle clamp, which is easily set to the desired bevel angle.

To accommodate the full range of pipe wall thicknesses and bar stock diameters, the torch head is driven through a variable-speed drive mechanism. Smooth, uniform motion of the torch head assures clean, accurate production cutting.

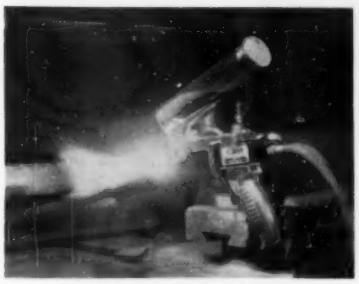
Speedi-Burn Products Co., Inc., 534 Linden St., West Hempstead, N. Y.

**T-7-1642**

## Spray Gun

Coatings of metals and ceramics can be thermal sprayed without the use of compressed air with the Metco Type P ThermoSpray Gun. Powder materials are applied at high speed and deposit efficiencies are better than 95 percent. High thermal efficiency permits use of high-melting-point materials.

ThermoSpray powders, specially developed for use with the ThermoSpray gun, are held either in the reservoir on top of the gun or in a separate hopper. The powders are fed through an abrasion-resistant connector into the gun



proper where they are picked up by gas flow and fed to the gun nozzle. Two lightweight hoses, attached to the rear of the gun, carry oxygen and either acetylene or hydrogen, depending on the work and the powder being sprayed.

Self-fluxing alloys used for hardfacing may be left in the as-sprayed condition, semifused, or can be completely fused to the base material. Stainless steel and bronze are used as-sprayed and provide coatings similar in many respects to those obtained with wire type metallizing guns.

Metallizing Engineering Co., Inc., 1101 Prospect Ave., Westbury, L.I., N. Y. **T-7-1651**

USE READER SERVICE CARD ON PAGE 169 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

## Fluid Drives

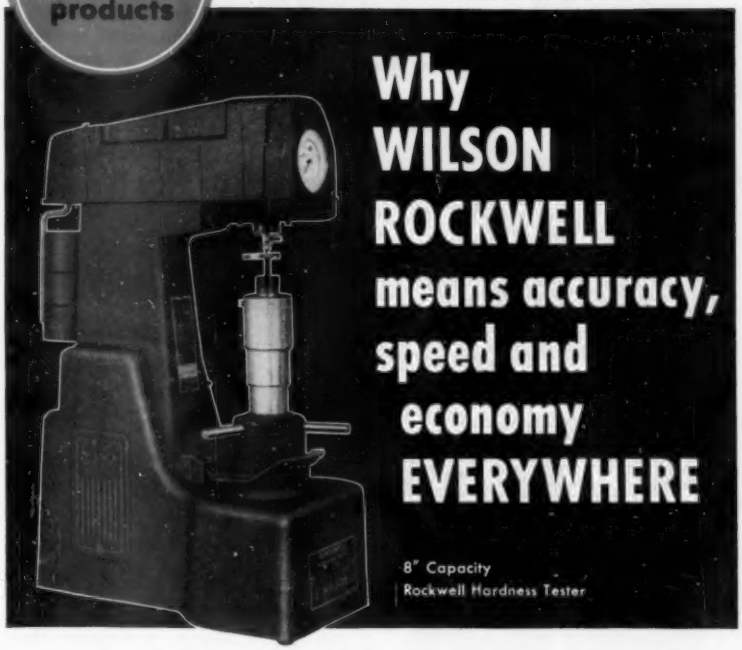
A series of Class 2 adjustable-speed Gyrol fluid drives for 1 through 25-hp applications is designed for installation where minimum maintenance, automatic speed adjustment and accuracy of repeat speed settings are essential. The self-contained units can be operated continuously without attention.

They can be used with single-speed motors for manual or automatic adjustable, stepless speed control. Where a two-directional motor is used, the fluid drive and load can be reversed while in motion.

The totally enclosed drives are available in 4 sizes. All units can be used


ACCO products

**Wilson "Rockwell"* Hardness Testers**




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Whether your hardness tester is required for use in laboratory, tool room, inspection department or on the production line, there is a WILSON model to serve you best.

**Consultation is as Close as the Phone**

Changing work conditions frequently call for different accessories, sometimes a different model of tester. A WILSON expert is never more than a few hours away to make sure that the service you get from your WILSON equipment is all that you expect.

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Hardness testers must always operate at peak efficiency. WILSON owners know they can count on WILSON service to make sure that their equipment is always ready.

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A FULL LINE TO MEET EVERY HARDNESS TESTING REQUIREMENT

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**THESE 40-TON PRESSES**

**take job after job in stride and give you top speed and uniform output on a variety of work. They stress simplicity in every detail to achieve quicker set-ups, easier changeovers and simpler operation. All are extra rugged, high precision units, made to withstand hard usage and assure long, satisfactory service. They are very moderately priced.**

*Significant savings may result if you let our engineering staff assist you. There is no obligation.*

*Rousselle Presses are sold exclusively through leading machinery dealers.*

**Choice of 25 models in 5 to 40-ton sizes.**

*Manufacturers of Rousselle Presses*

**SERVICE MACHINE CO.**

**2310 WEST 78th STREET**

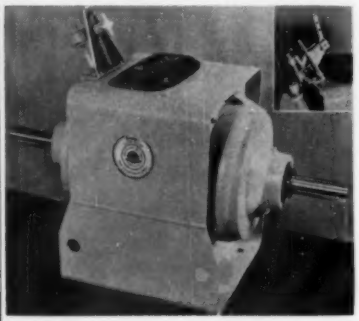
**CHICAGO 20, ILL.**

INDICATE A-7-166


at operating speeds of 1200 and 1800 rpm, and the two smaller sizes can also operate at 3600 rpm. Drives may be powered directly by a motor or through V-belts or chain. Output connection may be direct, belt or chain.

Cast end bells are designed with a flat surface to permit direct mounting of centrifugal pumps, or guards for flexible couplings or pulleys.

Speed reductions up to 4:1 are permitted for constant torque loads and 5:1



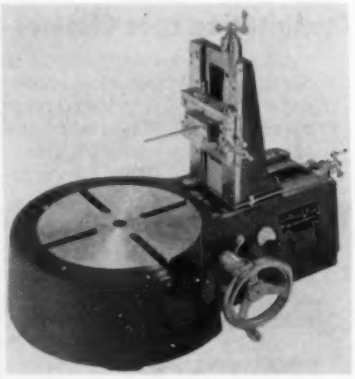
for variable torque loads. Either water or air type oil coolers are available.

Lengths (over shafts) of the drives range from 21¾ to 38¾ in.; heights, from 19⅞ to 22⅜ in.; and widths, from 15 to 18 in. for the 4 sizes.

American Blower Corp., Detroit 32, Mich. **T-7-1661**

## Contour Measuring Unit

Quick, accurate checking and inspecting of radial accuracy of contoured surfaces may be done with this



economical Contour-O-Scope measuring instrument.

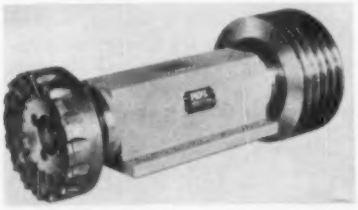
Easy to operate, the unit is designed for direct readings and does not require intricate setups or layouts.

Summit-Roberts Products, Inc., 830 New York Ave., Toledo, Ohio. **T-7-1662**

## Milling Spindle

Heavy-duty, belt-driven precision milling spindles are available in a range of sizes from 1 to 50 hp, with standard No. 10, 20, 30, 40, 50 or 60 milling machine noses.

These milling spindles are equipped with two big, cylindrical roller bearings which carry the radial loads. Their bores are tapered as are the massive



shafts in these spindles so that the bearings may be individually preloaded. A pair of precision thrust bearings also are permanently preloaded to stabilize the shaft axially.

The bearings are permanently lubricated and the spindles run at low temperature.

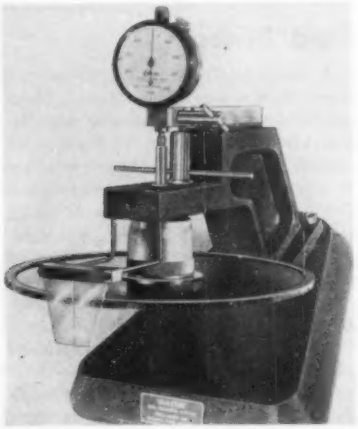
The milling spindles may be arranged to operate in any position. They are also available with totally enclosed, fan-cooled motor drives from 1 to 100 hp.

Pope Machinery Corp., 261 River St., Haverhill, Mass. **T-7-1663**

## Dial Indicator Checker

Easy-to-use Master dial indicator checker provides a quick, dependable method of checking accuracy of A.G.D. indicators.

In operation, accuracy of the dial indicator is checked against a calibrated wheel, 8 in. in diameter with a micrometer barrel as its hub. Graduations of 0.0001 in. are marked on the outer



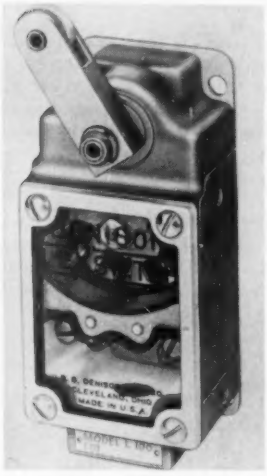
rim of the wheel and may be lined up with a hairline sight. The indicator contact point is set against the micrometer spindle by means of a vernier zero adjustment which does not require locking.

Petz-Emery, Inc., Pleasant Valley, N. Y. **T-7-1671**

## Limit Switches with Plactic Covers

A watertight plastic cover has been added to this line of Loxswitch limit switches in order to permit operator to observe contact action in the interior of the switch without removing the cover. The cover is designed to make it suitable for application where dusty, oily or wet conditions prevail.

The plastic covers are made with an



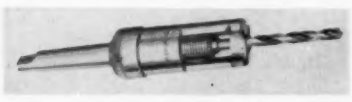
acrylic plastic material held in position by an especially designed steel frame and captive cover screws. A watertight neoprene gasket provides a positive water seal between the housing of the switch and the cover.

R. B. Denison Mfg. Co., 102 St. Clair Ave., N. W., Cleveland 13, Ohio. **T-7-1672**

## Drill Stops

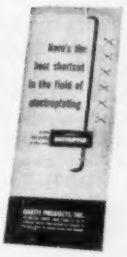
An improved line of drill stops can be used where several holes must be drilled to the same depth. These tools will stop accurately against a fixture bushing or the face of the work.

Micrometer adjustment has been added to units by the combination of a




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Oakite Rustripper removes rust and heat scale in the same operation that removes oil. It avoids hydrogen embrittlement, damage to machined surfaces and other disadvantages of acid pickling.

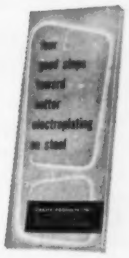



**Have you taken the four good steps?**

How can cleaning costs be reduced 33% while cleaning quality is being improved? *See pages 7 and 8 of booklet.*

What are four easy ways to improve the average rinse tank? *See page 10.*

What causes hydrogen embrittlement during electrocleaning? What is the remedy? *See pages 15 and 16.*




**Do you need a brass cleaner that gives better protection against tarnishing?**

Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current.




**"It cut our cleaning rejects by more than 90%"**

says a manufacturer who found that Oakite Composition No. 95 gave him:

**BRIGHTER PLATING**—All films removed . . . no residues, no undersurface shadows, no anodic blackening, nothing to impair the brightness of the electroplate.

**FEWER REJECTS**—Major causes of blistering and peeling eliminated . . . Consistent success in baking for 60 minutes at 300°F.




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precision calibrated quick-lock nut and a reference line on the threaded body of the tool. Depth adjustment is fast and easy. Changing tools also is a simple operation.

Chip windows prevent packing of chips around the tool and thus prevent chips from wiping grooves in the stopping face. Small body diameter permits operation on close centers and near shoulders or obstructions.

Standard drill stops are available in 8 sizes to accommodate drills up to 1½ in. diameter.

Scully-Jones and Co., 1901 S. Rockwell St., Chicago 8, Ill. **T-7-1681**

## Flatness Measurement Device

This unit designed to provide precision measurement of flatness, has a helium lamp to assure accurate measurements to 1 light band (0.0000116 in.) or less.

Compact and lightweight for easy portability, this device, called Monolight, is self-contained within its own metal case which measures only 5½ x 6 x 8¼ in. when closed.

The opal glass lighting area is 4⅛ x 7½ in. Dual vents are built into the

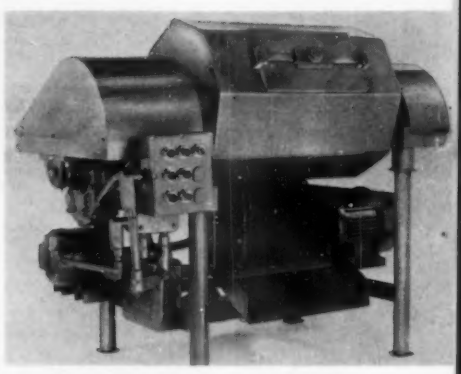


case to cool the heavy-duty enclosed transformer. For vibrationless measuring under all conditions, the unit is set on rubber mounts.

Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 41, Ill. **T-7-1682**

## Tumbling Barrel

This vibratory tumbling barrel is designed to provide both rotating and shaking action simultaneously, resulting in more work than conventional



units during a given length of time.

The unit also may be used in the field of stress relieving and for preplating operations.

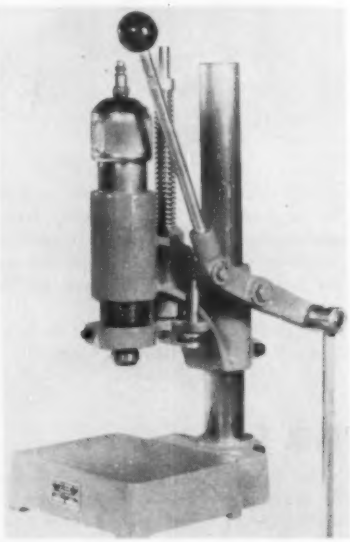
Elliott Mfg. Co., 350 State St., Binghamton, N. Y.

**T-7-1683**

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## Air Hammer

New high-speed repeating, or vibrating, air-operated impact machine, Model 150-RH, uses a 1-in. diam hammer-pellet at constant stroke, with vari-



able air pressure. Contact of the tool with the work opens the hammer valve, and as long as pressure is maintained by the foot pedal, the hammer shuttles up and down at a frequency of 6500 spm.

Heidrich-Nourse Co., 631 E. Third St., Los Angeles 13, Calif. **T-7-1684**




**ONE Drill Grinder Sharpens ALL Drills**

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# THE TOOL ENGINEER'S *Service Bureau*

## TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-7-240 | Ace Drill Bushing Co., Inc. | **Drill Bushings**—New catalog contains technical data, comparison tables, price lists and name of nearest dealer. (Page 240) |
| A-7-179-2 | Ace Drill Corp. | **Reamers**—Catalog No. 52A contains data on drills, hardened drill blanks and chucking reamers. (Page 179) |
| A-7-58 | Acme Industrial Co. | **Drill Jig Bushings**—Data available on micro, standard and tungsten carbide drill jig bushings, dowel pins, chamfer micrometer gages and portable bench centers. (Page 58) |
| A-7-14 | The American Tool Works Co. | **Radial Drills**—Bulletin 327 contains data on American radial drilling machines. (Page 14) |
| A-7-43 | The Cincinnati Milling Machine Co. | **Hydroforming**—Bulletin M-1908 contains data on Hydroforming. (Page 43) |
| A-7-210 | The Cleveland Crane & Engineering Co. | **Shearing Equipment**—Illustrated Catalog No. 2011 gives construction and engineering details. (Page 210) |
| A-7-171-1 | Arthur A. Crafts Co., Inc. | **Carbide Form Tools**—Catalog available on "Complete Carbide Tooling for Automation." (Page 171) |
| A-7-248 | Davis Boring Tool Div. Giddings & Lewis Machine Tool Co. | **Tapping Head**—Bulletin No. DB-160 describes Davis Tap-Saver applications for decreasing machining costs. (Page 248) |
| A-7-209 | Detroit Broach and Machine Co. | **Broaching Machines**—Six catalogs available on Detroit Broach broaching machines. (Pages 208-209) |
| A-7-162 | Detroit Power Screwdriver Co. | **Machine Attachments**—Catalog describes power methods for assembling and feeding jobs. (Page 162) |
| A-7-44 | DeVlieg Microbore Co. | **Toolholder**—Illustrated catalog describes Microbore Flash-Change toolholder. (Page 44) |
| A-7-10 | The DoAll Co. | **Gage Blocks**—Catalog contains data on DoAll rectangular and square block sets and block accessories. (Page 10) |
| A-7-252-3 | Elgin National Watch Co. | **Diamonds**—Booklet tells how diamond abrasive assures better metallographic specimens. (Page 252) |
| A-7-231 | Frauenthal Div. Kaydon Engineering Corp. | **Special Machine**—Bulletin No. 301 contains data on 3100 Series precision turning and grinding machines. (Pages 230-231) |
| A-7-179-1 | The Gaertner Scientific Corp. | **Microscope**—Bulletin 161-54 shows applications, models and specifications for toolmakers' use. (Page 179) |
| A-7-49 | General Mills Chemical Div. General Mills | **Epoxy Tools**—Booklet "Progress Thru Research" contains a fact-filled article on plastic tooling. (Pages 48-49) |
| A-7-193 | Greaves Machine Tool Co. | **Milling Machines**—Comparison chart on mills offered; also information on attachments and accessories for Greaves mills. (Page 193) |
| A-7-68 | Hanna Engineering Works | **Cylinders**—Catalog 233B gives details on Hanna fluid power cylinders. (Page 68) |
| A-7-45 | Hannifin Corp. | **Control Valves**—Bulletin 113 contains data on Series H hydraulic cylinders and bulletin 213 on Series A air power cylinders. (Page 45) |
| A-7-5 | Hardinge Bros., Inc. | **Lathes**—Bulletin HLV contains data on Model HLV 10-inch toolroom lathe. (Page 5) |
| A-7-66 | Haynes Stellite Co. Div. Union Carbide and Carbon Corp. | **Cutting Tools**—"Haynes Stellite Metal-Cutting Tools" booklet contains data on cutting tools. (Page 66) |
| A-7-185-2 | Ideal Industries, Inc. | **Live Centers**—Booklet contains data on Ideal's complete line of live centers. (Page 185) |

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TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

| Literature Number | COMPANY | DESCRIPTION |
|---|---|---|
| A-7-220 | The Ingersoll Milling Machine Co. | Cutting Tools—Ingersoll Cutter Catalog 66F describes line of inserted blade cutters. (Page 220) |
| A-7-153 | Marvel Engineering Co. | Filters—Three catalogs giving complete data on Marvel Synclinal filters. (Page 153) |
| A-7-40 | Metal Carbides Corp. | Carbide Tools—Catalog 56G contains data on reworking cutters to first-class condition, plus other Metal Carbide products. (Page 40) |
| A-7-155 | Micrometrical Mfg. Co. | Surface Measurement—Bulletin LT18 contains technical aspects on surface measurement. (Page 155) |
| A-7-270 | The Micro-Positioner Corp. | Reproduction—Bulletin TE-7 contains data on Micro-Positioner for repetitive reproduction. (Page 270) |
| A-7-151 | Nelco Tool Co., Inc. | Cutting Tools—Illustrated 24-page manual on "Suggestions for Operating and Maintaining Nelco Tools." (Page 151) |
| A-7-7 | Niagara Machine & Tool Works | Presses—Bulletin 56 contains facts on new Series E inclinable presses. (Pages 6-7) |
| A-7-206-2 | Northwestern Tool & Eng. Co. | Setup Component—Catalog No. 23 contains data on T-nut and stud sets, step block and clamp sets, and punch press sets. (Page 206) |
| A-7-242-2 | Numberall Stamp & Tool Co. | Numbering Machine—Bulletin TE-70 contains data on Multi-Wheel numbering machine Model 70. (Page 242) |
| A-7-67 | The OK Tool Co., Inc. | Milling Cutters—OK's new multidiam tool book now available. (Page 67) |
| A-7-52 | Pines Engineering Co., Inc. | Bending Machines—Cost-cutting ideas in latest bending and end finishing techniques are discussed in Pines News. (Page 52) |
| A-7-184 | Ready Tool Co. | Grinding—Red-E, "New Concept in the Art of Grinding" explains grinding accuracy to within less than 0.000050 t.i.r. (Page 184) |
| A-7-243 | Rivett Lathe & Grinder, Inc. | Power Units—Booklet contains data on Rivett hydraulic solenoid panel valves. (Page 243) |
| A-7-147 | Seibert & Sons, Inc. | Special Tools—Brochure illustrates and describes Seibert's complete line of holding and driving tools. (Page 147) |
| A-7-235 | Sundstrand Machine Tool Co. | Machine Tools—Bulletin 769 contains facts on the line of Sundstrand machine tools and "Engineered Production" service. (Pages 234-235) |
| A-7-148 | Taft-Peirce Mfg. Co. | Gages—Catalog No. 613 contains data on Comp-U-tair air gage. (Page 148) |
| A-7-185-1 | Twentieth Century Mfg. Co. | Cutting Tools—New selective catalog on cutting tools available. (Page 185) |
| A-7-182 | Uddeholm Co. of America, Inc. | Tool Steels—New tool steel stock list No. 12 available. (Page 182) |
| A-7-190 | U. S. Tool Co., Inc. | Special Machines—Bulletin 15-T contains specifications for U. S. Multi-Slide machines. (Page 190) |
| A-7-54 | Universal Engineering Co. | Drill Bushings—New 98-page catalog describes line of Universal products. (Page 54) |
| A-7-204 | The Van Keuren Co. | Gages—258-page Catalog and Handbook No. 36 contains technical engineering information on measuring problems and methods. (Page 204) |
| A-7-154 | Wales-Strippit Corp. | Die Equipment—Bulletin No. 12F contains data on the Wales-Way punching units. Page 154) |
| A-7-202 | The Yoder Co. | Slitters—Book contains time studies, production records, and other data on the economics as well as mechanics of slitter operation. (Page 202) |

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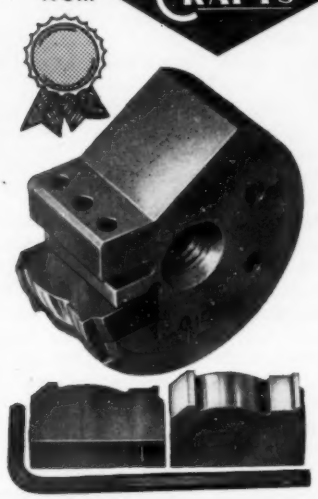
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INDICATE A-7-171-1


# who's meeting and where

**July 10-12.** Western Packaging and Materials Handling Show, Pan Pacific Auditorium, Los Angeles, Calif. More facts may be obtained from Richard S. Wolcott, Clapp and Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

**July 30-Aug. 3.** American Machine Tool Distributors Assn. and National Machine Tool Builders' Assn. Machine tool sales conference, Purdue University, West Lafayette, Ind. Get further details from NMTBA headquarters, 2071 E. 102nd St., Cleveland, Ohio.

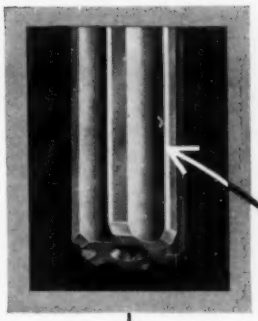
**Aug. 6-8.** Society of Automotive Engineers, Inc. National West Coast meeting, Mark Hopkins Hotel, San Francisco, Calif. More information is available from society office, 29 W. 39th St., New York 18, N. Y.

**Aug. 6-17.** University of California at Los Angeles, Department of Engineering, cooperating with University Extension and Los Angeles Section of American Society of Quality Control sponsoring a course on Statistical Methods in Industry; includes basic course in quality control by statistical methods and advanced course in industrial statistical methods. Request more details from Prof. Edward P. Coleman, Dept. of Engineering, UCLA, Los Angeles 24, Calif.

**Aug. 22-24.** American Society of Civil Engineers. Annual meeting of national hydraulics division. University of Wisconsin. Inquire for details from Prof. Arno T. Lenz, College of Engineering, University of Wisconsin, Madison, Wis.

**Sept. 7-9.** Metal Powder Assn. Fall meeting, The Homestead, Hot Springs, Va. Get full particulars from association office, 420 Lexington Ave., New York 17, N. Y.

**Sept. 9-12.** National Metal Trades Assn. Eastern plant management conference, Essex-Sussex Hotel, Spring Lake, N. J. Association office, 122 S. Michigan Ave., Chicago 3, Ill., can supply other facts.

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INDICATE A-7-171-2

**Sept. 9-12.** American Institute of Chemical Engineers. Fall meeting. William Penn Hotel, Pittsburgh, Pa. Direct inquiries to 120 E. 41st St., New York 17, N. Y.

**Sept. 10-15.** Investment Casting Institute. Intensive 6-day course, University of Michigan. For more data, write to institute office, 27 E. Monroe St., Chicago 3, Illinois.

**Sept. 11-13.** American Die Casting Institute. Annual meeting, Edgewater Beach Hotel, Chicago, Ill. Write for other data to institute office, 366 Madison Ave., New York 17, N. Y.

**Sept. 11-14.** Packaging Machinery Manufacturers Institute. Packaging machinery and materials exposition, Public Auditorium, Cleveland, O. For further information, contact Hanson & Shea Inc., One Gateway Center, Pittsburgh 22, Pa.

**Sept. 16-21.** American Chemical Society. Annual meeting, Convention Hall, Atlantic City, N. J. Society office, 1155 16th St. N.W., Washington 6, D.C., will provide further data.

**Sept. 16-22.** American Society for Testing Materials. 2nd Pacific area national meeting and apparatus exhibit, Hotel Statler, Los Angeles, Calif. Details may be had from society office, 1916 Race St., Philadelphia 3, Pa.

**Sept. 17-21.** Instrument Society of America. 11th annual instrument-automation conference and exhibit, New York Coliseum, New York, N. Y. Direct inquiries to society office, 1319 Allegheny Ave., Pittsburgh, Pa.

**Sept. 19-21.** Porcelain Enamel Institute, Inc. 25th annual meeting. The Broadmoor, Colorado Springs, Colo. Institute headquarters, 1145 Nineteenth St., N. W., Washington 6, D.C., can provide other data.

**Sept. 21.** Cutting Tool Manufacturers Assn. Fall meeting, Lockmoor Club, Detroit, Mich. Write to association office, 416 Penobscot Bldg., Detroit 26, Mich. for details.

**Sept. 24-25.** Material Handling Institute. Fall meeting, Greenbrier, White Sulphur Springs, W. Va. For more facts write institute office, One Gateway Center, Pittsburgh 22, Pa.

**Sept. 24-25.** Steel Founders Society of America. Fall meeting, The Greenbrier, White Sulphur Springs, W. Va. Request more information from society office, 606 Terminal Tower, Cleveland 13, Ohio.

**Sept. 25-27.** Atomic Industrial Forum, Inc. 2nd annual trade fair of the atomic industry, Navy Pier, Chicago, Ill. Get other facts from organization's office, 260 Madison Ave., New York 16. N. Y.

**Sept. 25-28.** Association of Iron and Steel Engineers. Annual meeting and exposition Public Auditorium, Cleveland, Ohio. Write for details to association office, 1010 Empire Bldg., Pittsburgh, Pa.

**Oct. 1-3.** National Electronics Conference Inc. Annual meeting and exhibit, Sherman Hotel, Chicago, Ill. Details are available from conference headquarters, 84 E. Randolph St., Chicago 1, Ill.

**Oct. 1-5.** American Institute of Electrical Engineers. Fall general meeting, Morrison Hotel, Chicago, Ill. Write for more information to institute office, 33 W. 39th St., New York 18, N. Y.

**Oct. 2-6.** Society of Automotive Engineers Inc. National aeronautic meeting, aircraft production forum and aircraft engineering display, Hotel Statler, Los Angeles, Calif. More information may be had from society office, 29 W. 39th St., New York 18, N. Y.

**Oct. 3-5.** Standards Engineers Society, Fifth annual meeting on "Standards—Guides for Tomorrow," Hotel Willard, Washington, D. C. Write to the society, P.O. Box 281, Camden 1, N. J. for more information.


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Eclipse Radial Drive High Speed Steel Cutter bores 5 diameters in steel part.

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Radial Drive Tungsten Carbide Tipped Cutter bores gear pocket in oil pump.

Multi-diameter cutter with Tungsten Carbide Tipped inserted blades for boring, counterboring and chamfering.

**Since 1913—through two wars and during the peace years—Eclipse has met the exacting and changing demands of industry for special purpose and cutting tools. What better test? What better recommendation? Our large modern plant can serve you, too. Send your problem to us, today!**

**ECLIPSE COUNTERBORE CO.**

*Founded in 1913*

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# Men at Work

**Walter W. Tangeman** has been elected chairman of the board at the recent organization meeting of the directors of Cincinnati Milling Machine Co. He has been executive vice-president since 1934.

At the same time, **Swan E. Bergstrom**, who has been a vice-president and manager of the Machine Tool Div., was named executive vice-president. Mr. Bergstrom is a member of ASTE's Cincinnati chapter.

**William E. Rudel** has been named to the newly created post of executive vice-president of Rudel Machinery Co., Inc. At the same time, **Herman F. Zorn**, sales engineer in the Schenectady area, was appointed a vice-president, and was elected a member of the board.

Appointment of **John Booth** to the office of vice-president in charge of research has been made public by Abrasive Dressing Tool Co. Mr. Booth formerly was a vice-president at X-Ray Inc. in charge of automatic development.

**Glen J. Hartman** is new manager of operations of Ohio Seamless Tube Div. of Copperweld Steel Co. succeeding **Raymond E. Dewey** who resigned. Mr. Hartman has served as assistant manager of operations since May 1955.

**Joel Hunter** has been elected chief executive officer of Crucible Steel Co. of America, assuming responsibility for general management of the company's activities. Mr. Hunter, who has been president of the firm since May, 1954, succeeds **William P. Snyder, Jr.**, Crucible chairman, who announced his desire to be relieved of active management of company affairs. Mr. Snyder continues as chairman, presiding at meetings and acting in an advisory capacity.

Two promotions recently announced by Austenal Laboratories, Inc. involved **Paul F. Collins** and **Albert M. Talbot.** Dr. Collins, formerly vice-president in charge of the Microcast Div., now directs operations of all three divisions of Austenal. Mr. Talbot, while retaining his position as director of research, succeeds Dr. Collins as head of Microcast.

**Fred W. Lucht** has rejoined Goddard & Goddard Co. with which he was associated until 1931 when he resigned to join Carboloy Co. At Goddard and Goddard he will be in charge of a cutting tool application research laboratory to be created under his supervision and will continue programs of research and development.

Noble & Westbrook Mfg. Co. has announced election of officers to serve the company. **William C. Westbrook** is chairman of the board, **G. Edgar Westbrook** is president, and **Howard B. Noble** is vice-president and treasurer.

**Robert S. Ingersoll** was elected president of Borg-Warner Corp. in a major reorganization of the firm's top management. He formerly was an administrative vice-president. **Roy C. Ingersoll,** was reelected board chairman and was named chief executive officer but relinquished the presidency which he has held for six years. **Lester G. Porter,** previously an administrative vice-president, was elected to the newly recreated position of executive vice-president.

**Henry M. McAdoo, Jr.**, became vice-president-manufacturing of Nice Ball Bearing Co. effective July 1 to succeed **J. E. Mullen** who retired. Mr. McAdoo is followed in his former post of plant manager by **John J. Larkin** who has been chief engineer, a position now filled by **Thomas E. Spence.**

**George A. Roberts**, formerly vice-president of Royalcall, Inc. has been named chief engineer of Cleveland Metal Specialties Co.

**Marvin R. Anderson is new president of Michigan Tool Co., succeeding Oscar L. Bard who became board chairman. Mr. Anderson, who was previously executive president, is a member of ASTE's Detroit chapter.**



**Eduard Baruch is president of Heli-Coil Corp., succeeding Louis R. Ripley who became board chairman. Mr. Baruch, who was instrumental in forming Heli-Coil, has been a vice-president and a director since 1951.**

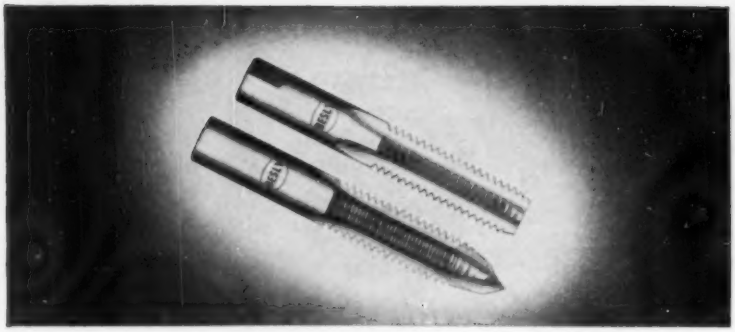


**J. J. Chyle was elected to serve as president of the American Welding Society at that organization's recent annual meeting. Mr. Chyle is the director of welding research at A. O. Smith Corp.**



**Gordon W. Smithson has been named vice-president and chief engineer of Potter & Johnston Co. Associated with the company for the past 20 years, he has served in the capacity of chief engineer since 1953.**





# New Besly Stub Tap for Screw Machines

***Saves Set-up Time, Fits Standard Bushings, Has Stronger Shank***

***Available at No Extra Cost from BESLY***

A new, shorter length tap that eliminates the need to make alterations before using it in screw machines has just been developed by Besly in cooperation with the National Screw Machine Products Association.

**SHORTER SHANK, SHORTER THREADED PORTION**

The shank (and threaded portions in larger sizes) of the new Stub Tap have been shortened to enable it to fit into the space between the spindle nose and tool holder of screw machines. In the past, it has been necessary for users to cut off part of the shank and even part of the threaded portion of standard hand taps to fit them into screw machines . . . or order higher priced "specials."

**SIMPLIFIES BUSHING INVENTORY**

The shank of a Stub Tap is the same size as its nominal O.D. This permits standard sized bushings to be used and reduces bushing inventory problems. The full diameter shank provides greater strength than standard hand taps which have shanks usually turned down in the larger sizes.

**FACTORY-PERFECT ACCURACY**

The shank of the Stub Tap is made concentric with the threaded portion, assuring accurate alignment in the tool holder. Since it is not necessary to cut off the forward threaded portion of a Stub Tap, chamfer is maintained factory-perfect. Squares, except for two small driver flats at the end of the Stub Tap, are eliminated. This permits better holding power, better alignment and longer accuracy.

**AVAILABLE IN SIZES THROUGH 1-IN.**

The new Stub Tap is available at no extra cost from Besly distributors. It is made in fractional sizes from ¼-in. through 1-in. and in machine screw sizes from No. 0 through No. 14. See your Besly distributor or write for the sizes you need.

**BESLY HAS THE COMPLETE LINE**



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*Est. as C. H. Besly & Co. in 1875*
118 Dearborn Avenue, South Beloit, Illinois

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The Board of directors of Aluminum Co. of America has elected five new vice-presidents. They include **H. E. Bakken,** general manager of the refining division; **J. P. Haight,** chief engineer; **Lawrence Litchfield, Jr.,** general manager of the mining division; **R. T. Whitzel,** general production manager; and **Edward B. Wilber,** treasurer.

**John A. Marsh** is new vice-president in charge of air and hydraulic sales for Rivett Lathe & Grinder, Inc. Since January 1950, he has served as sales manager of the Air and Hydraulic Div.

**Robert K. Smith** has been made manager of Research for E. F. Houghton & Co. Dr. Smith was previously chief of the exploratory research section of Houdry Process Corp.

**Albert J. Fischer** has been named to the post of works manager of Adams Carbide Corp. He formerly was director of research and development.

At the same time, the company announced that **Michael J. Kniola,** previously associated with Carboloy Dept. of General Electric, has joined Adams as production manager.

**Paul Pick** has been appointed chief engineer of The Allen Mfg. Co. Mr. Pick, who formerly was engineering project coordinator, is a member of ASTE's Hartford chapter.

New plant manager of the Omaha Production Div. of Vickers Inc. is **Russell Dupuis.** Associated with Vickers for the past 20 years, Mr. Dupuis was formerly production control manager for Detroit activities and responsible for allocating production to out-of-town Vickers plants.

**Ernest W. Marchand** has been made director of manufacturing of Greer Hydraulics, Inc. Formerly vice-president in charge of manufacturing at Evans Products Co., he brings to Greer 30 years' experience in manufacturing, much of it in automotive production.

**Paul W. Coffman** has been appointed superintendent of the Cold Mill Div. of Acme Steel Co. He has been associated with Acme steel since 1950 as assistant superintendent of the division.

As superintendent of its Tool and Machine Mfg. Div., Acme Steel Co. named **Dale L. Bennett,** who has served as assistant superintendent of the division for the past 6 years.

Earlier, Acme Steel announced appointment of **John R. Davey** as manager of the metallurgical department. He formerly was assistant chief metallurgist.

# TRADE literature

*For Free Booklets and Catalogs — Convenient Request Card on Page 169*

### Punching Units

Extensively illustrated with photos and drawings, 48-page catalog fully describes Unipunch Series A, B, C and AE hole punching units and Uninotch Series A and B notching units, outlining main features of models in each line and listing dimensions and specifications; also includes section on engineering data regarding mountings, accessories, die button adapters and replacement parts. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y. **L-7-1**

### Hardness Tester

Leaflets present factual information on company's portable Brinell hardness tester, Brinell tester for large gears and Brinell microscope. Well illustrated with application photos. King Tester Corp., 440-44 N. 13th St., Philadelphia 23, Pa. **L-7-2**

### Spring Motors

Comprehensive up-to-date information for design of Neg'ator constant-torque spring motors presented in illustrated 25-page booklet; discusses general principles, physical and operational characteristics, typical applications and application limitations; explains design procedure and formulas. Neg'ator Div., Hunter Spring Co., Lansdale, Pa. **L-7-3**

### Die Cushions

Twenty-four page brochure shows all types of die cushions for presses with JIC bed openings from 14 x 14 in. to 213 x 87 in.; with complete performance and dimensional data on all cushions; includes recommended formulae for computing cushion capacities plus other pertinent engineering aids. Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. **L-7-4**

### Fasteners

Revised 30-page catalog, punched for loose-leaf binding, covers standard Unbrako fasteners; easy-to-read tables show size ranges and specifications; engineering type drawings clarify text; booklet also serves to introduce new kit of socket screw keys containing 11 long-arm keys in sizes ranging from 0.050 to 3/8 in. across-flat. Standard Pressed Steel Co., Box 786, Jenkintown, Pa. **L-7-5**

### Modernizing Equipment

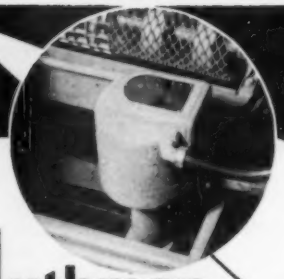
Series of new special-application machine tools, rebuilt and modernized equipment presented in issue No. 6 of "The Simmons Way" emphasizing details of company's special machine building techniques; illustrated case histories used to show advantages of modernized equipment. Simmons Machine Tool Corp., 1701 Broadway, Albany 1, N. Y. **L-7-6**

### Perforating Dies

Catalogs No. 55 and No. M-55 present details on company's lines of adjustable and magnetic perforating dies respectively; both are extensively illustrated with engineering drawings and include application information, specifications and cost information, as well as outlines of special features. S. B. Whistler & Sons, Inc., 744 Military Rd., Buffalo 23, N. Y. **L-7-7**



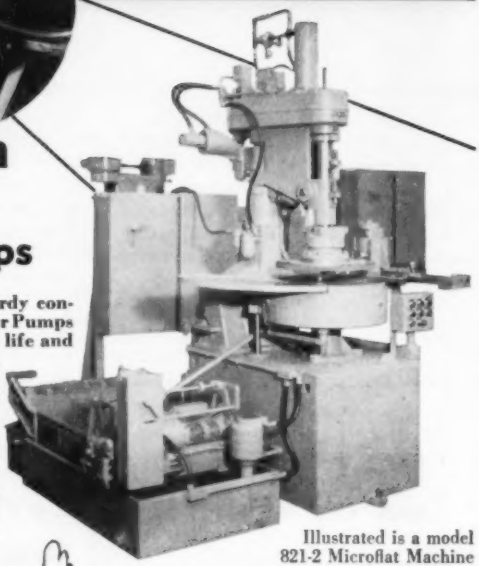

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**Designed to do a better job**

**Ruthman Gusher Coolant Pumps**

**The simple designs and sturdy construction of Ruthman Gusher Pumps assure you long trouble-free life and efficient operation. There are fewer parts to wear, prelubricated heavy-duty ball bearings require no further lubrication — electronically balanced rotating assembly cuts vibration to minimum. So be sure to specify the pumps that are designed to do a better job . . . "Gusher" Pumps.**



Illustrated is a model 821-2 Microflat Machine equipped with a "Gusher" Coolant Pump— Photo courtesy of Micromatic Hone Corp.

THE **RUTHMAN** MACHINERY CO.
1810 READING ROAD CINCINNATI, OHIO

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**THE NEW WAY TO CHECK A FLAT SURFACE**

***—Without Touching It—***

USE A

**DAVIDSON PLANO-INTERFEROMETER**



THE DAVIDSON MODEL D-308

With a Davidson plano-interferometer you can check the flatness of any surface smooth and flat enough to reflect light. With it you eliminate all risk of damage to highly polished surfaces such as optical flats, gage blocks, lapped surfaces, seals, etc., because the work you are testing never comes in contact with the reference flat, which is safely housed inside the instrument. Comparison is visual only, preventing any possibility of wear to the optical flat or work being tested.

Davidson plano-interferometers are built in horizontal and vertical types. They are designed for use on the production line as well as on the inspection bench. With them you can optically measure surface flatness to 1/10 of a fringe or to .000001 of an inch.

***If you have an inspection or measurement problem of extreme accuracy, Davidson can help you solve it.***

Send for descriptive literature.

**DAVIDSON MANUFACTURING CO.** *Since 1932*
2223 RAMONA BLVD., WEST COVINA, CALIF., U.S.A.

*One of America's Finest Optical Plants*

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-176-2


### Welding Equipment

Illustrated, 20-page buyers' guide, GEC-1033, covers G-E welding equipment, electrodes and accessories; includes ratings, dimensions and specifications for all equipment. General Electric Co., Schenectady 5, N. Y. **L-7-8**

### Subland Tools

Twenty-eight page catalog illustrates and describes all types, uses and advantages of subland tools; discusses various applications and resultant economies. Mohawk Tools, Inc., 910 E. Main St., Montpelier, Ohio. **L-7-9**

### Carbide Tools

Informative 32-page reference catalog covers complete line of carbide tool products; dimensional drawings and specification lists accompany descriptions of blanks, inserts, carbide tipped tools, Gammax tool holder and combinations cutters plus end mills and twist drills; also includes list of Coromant standard grades, carbide manufacturers' grade recommendations and diagrams illustrating cutting speed and horsepower requirements. Coromant Div., Sandvik Steel, Inc., 1702 Nevins Rd., Fair Lawn, N. J. **L-7-10**

### Atomic Energy

Graphite for atomic energy applications described in 6-page leaflet S-4905; tabulates typical properties of graphite, points out its advantages for certain uses; graphs present data on strength-to-weight ratio and tensile strength as a function of temperature, National Carbon Co., Dept. E, 30 E. 42nd St., New York 17, N. Y. **L-7-11**

### Gun Drills

Illustrated leaflet describes carbide tipped gun drills, stressing applications advantages and factors for successful use; lists dimensions available and gives suggested range of speeds and feeds. Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. **L-7-12**

### Multiple Tools

Book of prints shows in detail construction of 50 special multidiam tools including boring heads, form cutters, milling cutters, end mills, reamers, trepanning tools all designed to perform 3, 4 or more operations with one pass. The O.K. Tool Co., Inc., Milford, N. H. **L-7-13**

### Toolholders

Catalog VR-437 describes line of toolholders and carbide inserts; well illustrated with drawings and diagrams; includes specifications and cost information. Vascoloy-Ramet Corp., Waukegan, Ill. **L-7-14**

### Low Temperature Melting Alloys

Folder lists 63 useful applications in design, pattern and model reproduction, punch and die part anchorage and holding work for their group of low-temperature-melting alloys. Cerro de Pasco Corp., 300 Park Ave., New York 5, N. Y. **L-7-15**

### Air Operated Chucks

Illustrated 20-page brochure discusses design features, applications and advantages of Stace precision air operated chucks. Includes specifications and dimensions. Crodian & Co., 4897 Kessler Blvd., East Drive, Indianapolis 20, Ind. **L-7-16**

### Electrical Standards

Revised 44-page manual on Machine Tool Electrical Standards developed and adopted by National Machine Tool Builders' Assn. Provides clear distinction between practices that are mandatory and those simply recommended; treats in detail such subjects as motor and circuit protection, control circuits and circuit enclosures, and specifications for conductors; also includes index and glossary of electrical terms. National Machine Tool Builders' Assn., 2071 E. 102nd St., Cleveland, O. **L-7-17**

### Tool Holders and Tips

Throwaway Insert Tooling catalog covers complete line of throwaway holders and tips; discusses special features including idea of combining variety of standard elements to make up semispecialized tooling for individual jobs; extensively illustrated, and includes specifications and dimensions. Valenite Metals Corp., Box 205, Royal Oak, Mich. **L-7-18**

### Holding Devices

Broad line of precision holding devices described and illustrated in 24-page brochure; illustrated with photos and drawings to show main features and advantages; outlines typical tooling problems and offers economical solutions. Heinrich Tools, Inc., 1536 Clark St., Racine, Wis. **L-7-19**

### Investment Castings

Design data accumulated during 10 years' experience outlined in 40-page booklet; also includes typical physical, mechanical and chemical properties of 26 investment-casting alloys; offers helpful suggestions as to when to consider investment-casting process to solve design, production and metallurgical problems. Numerous photos and case histories serve to illustrate various points. Haynes Stellite Co., Adv. Dept., Distribution Section, 30-20 Thomson Ave., Long Island City, N. Y. **L-7-20**

### Metal Stampings

Form #151 discusses in detail the technique, equipment and other points of know-how involved in producing die-cut parts in small lots; shows design and construction of type of dies used for short-run operations; well illustrated with photos, drawings and diagrams. Dayton Rogers Mfg. Co., Minneapolis 7, Minn. **L-7-21**

### Crib Control

Various illustrated leaflets and reprints explain operation of McCaskey Tool crib control and discusses its resultant economy and other advantages; one leaflet presents case histories in 20 plants to show 12 different cost cutting results. McCaskey Industrial Div., Victor Adding Machine Co., 3900 N. Rockwell St., Chicago 18, Ill. **L-7-22**

### Torque Manual

Second edition of Torque Manual includes torque application formulas with illustrations to clarify text; tables show screw torque data including minimum torsional strength tabulations, torque and tension relationship charts for high tensile and mild steel screws and torque conversion tables; also explains and illustrates solutions to adapter problems, and offers information covering general principles of torque wrenches. P. A. Sturtevant Co., Addison, Ill. **L-7-23**

### Punches and Dies

Catalog #105 illustrates large expanded range of sizes of punches and dies plus new products in several grades of steel. Ring Punch & Die Co., Jamestown, N. Y. **L-7-24**


**CARB-O-PLATING**

***brings you* CARBIDE WEAR LIFE**

***at Substantially Lower Cost***

By the application of a thin wear-resistant coating of tungsten carbide—by means of the Linde Process—the life of gages, parts and tools is extended many times over.

Carb-O-Plating as employed by Lincoln Park offers you definite advantages. It provides the wear life of carbide at a cost considerably lower than when solid material is used. And because it is applied over a steel base, the products have resistance to mechanical shock and are not subject to breakage as can occur with sintered carbide. The process also makes possible the highest degree of accuracy in finished products.

In addition to these features, Lincoln Park offers the extra advantage of extremely fine finishes—characteristic of all the company's precision products. Full information on Carb-O-Plating is yours for the asking. Write today.



THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

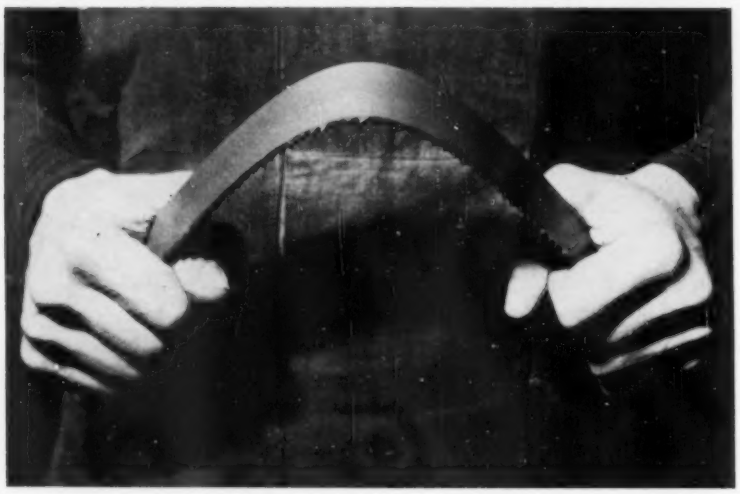
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# technical Shorts

**Metal Removal By Chemicals**

METAL is being removed from parts by a chemical etching process to achieve minimum weight without sacrificing required strength. The technique, which is being used by U. S. Chemical Milling Corp., offers several advantages. It enables complex shapes such as spheres, spirals and sharp corners to be easily handled. It also permits economical processing of short runs, or even of a single part. Metal may be removed on more than one side of a part at one time, and there are no restrictions regarding direction of cut, shape of part or radius of cutter.

## THIS is No Ordinary Power Hack Saw Blade

This is the *unbreakable* MARVEL High-Speed-Edge Hack Saw Blade—the first bi-metal blade—invented, developed and introduced by MARVEL. This blade is a combination of two materials best suited to the requirements of an efficient hack saw blade . . . a narrow high speed steel cutting edge permanently welded to a tough, non-brittle alloy steel body. Each blade is triple tempered to assure long life and maximum toughness to the cutting edge.

With a MARVEL Blade, you can cut any material—from the free machining steels to the toughest alloys . . . fast, accurately and economically. You can tension a MARVEL Blade from 200% to 300% tauter than any ordinary blade, permitting much higher speeds and heavier feeds without deflection or breakage.

Like all good things, attempted copies of the MARVEL Blade have been numerous, but its performance has been *unequalled* by any of the imitators. Ask for MARVEL Blades by name and you can be sure you're getting the best on the market. Leading Industrial Distributors have them in stock.

*Write for latest cutting tool Bulletin and the name of your nearest* MARVEL *Distributor.*

FB-1020

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

**ARMSTRONG-BLUM MFG. CO. 5700 W. Bloomingdale Ave., CHICAGO 39, U.S.A.**

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**Nuclear Power Plants By 1960**

THE ATOMIC ENERGY Commission has issued construction permits for two large-scale nuclear power plants. Scheduled completion dates for both plants are around October 1, 1960. Subject to final hazards studies, these permits will be converted to 40-year licenses. Consolidated Edison Co. of New York, and Commonwealth Edison Co. of Chicago, the two companies involved, plan their construction sites at Buchanan, N. Y. and in Grundy County, Ill., respectively. Consolidated will operate a pressurized water converter reactor that will require about 5,699 kilograms of U-235 for a 40-year period. Commonwealth will use about 8,323 kilograms during the 40-year period. The Commonwealth plant will have a net generating capacity of 180,000 kw. The Consolidated reactor will furnish about 140,000 kw but an additional 96,000 kw will be obtained by using an oil-fired superheater to raise steam temperature to about 1000F. Consolidated feels it will take about two years of operation to reach the "steady state."

★ ★ ★

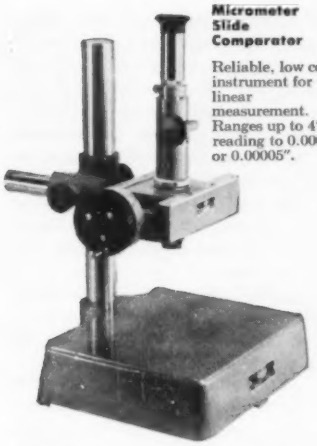
**Use Gallium As Glass Sealant**

LONG AVAILABLE, seldom used Gallium metal is now being used as a sealant for glass joints and valves in laboratory vacuum equipment. This successful application of the metal promises to reduce operating costs because it prevents need for repeated dismantling of retorts and tubing to clean and reseal leaking joints. Intricate equipment can be operated efficiently with simple, low-cost, smooth glass joints.

To date joints often fail because silicone grease, most widely used sealing medium, is subject to evaporation by high vacuum, and is dissolved by cleaning solutions.

Gallium resists both attacks. It does not boil until temperature exceeds 3500 F; however, it becomes liquid at 86.5 F, and so is easy to insert in the joint sleeve, where it clings instantly to the glass surface. As it cools to room temperature, gallium again becomes solid and expands, forming a perfect seal. Its low melting point also simplifies subsequent equipment dismantling

Novel use for the 80-year-old metal was discovered at the East St. Louis, Ill. works of Aluminum Co. of America's refining division. In a recent experiment, effective operating time of a tapered ground glass joint was more than doubled the gallium sealant.



**Micrometer Slide Comparator**

Reliable, low cost instrument for linear measurement. Ranges up to 4", reading to 0.0001" or 0.00005".

*Gaertner measuring microscopes*

## Easy, sure measurement to 0.0001" cuts rejects and speeds production

Precise, versatile, easy-to-use Gaertner measuring microscopes assure positive, direct measurement of precision parts. You see clear, sharply-defined images. No physical contact to distort or injure object being measured. Enjoy new production savings with Gaertner optical instrumentation. Write for complete data on the Gaertner line of industrial microscopes.



**Toolmakers' Microscope**

Ultimate in measuring microscopes. Range 2" x 4", reading to 0.0001", angular measurement to 1 minute.



**Coordinate Measuring Microscope**

High precision, low cost instrument for 2-dimensional linear measurement. Range 2" x 2", reading to 0.0001".



**Filar Micrometer Microscope**

High quality, low cost instrument for extremely precise measurements. Range 0.08", reading to 0.00002".

**Write for Bulletin 161-54 showing applications, models, specifications.**

**The Gaertner Scientific Corporation**

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Telephone: BUckingham 1-5335

INDICATE A-7-179-1


# abstracts of FOREIGN LITERATURE


By M. Kronenberg
Consulting Engineer


### Piercing Temperatures

Displacement of molecules in the flow of metal and the friction occurring between piercing punch and workpiece are causes of the high local temperatures encountered in the piercing of metals, according to R. Dies writing in Issue No. 10, 1955 of *Werkstatt und Betrieb*.

The temperatures are affected by the elastic deformation of the material around the hole in a direction approximately square to the direction of motion of the tool. A 3½-ton press was used for measuring the temperatures at the instant the punch traveled through the workpiece. One leg of a thermocouple was attached to the workpiece and another one to the tool, thus forming a thermocouple when the two pieces were engaged. The thermocouple was connected to an amplifier and oscillograph and diagrams were obtained which indicated the temperature change from the instant when the tool entered the workpiece until it left it. The temperature increases during the downstroke, drops at the instant of stroke reversal and increases again to an even higher degree during the upstroke.

Considerable differences in the temperatures were measured in piercing different materials. With brass the temperatures were about 230 to 300 F, the variation being due to the condition of the tool, namely, whether a ground, turned or lapped tool was used. With bearing material Nida, the temperatures varied between 480 and 550 F. The temperatures were higher when piercing new-silver where they were 570 to 600F. Piercing steel, equivalent to SAE 1035, produces much higher temperatures, namely, from 1000 to 1100 F. An alloyed steel was used for the tool in order to be able to form a thermocouple. Even a small addition of an alloy in one leg will readily form a thermocouple with steel.

The effect of the speed of the piercing press on temperature was insignificant. Tool speeds varied in a ratio of 1:4 without a noticeable change in the temperature. The effect of a lubricant on




*Get* **smoother, more accurate** *holes* **with "ground-from-the-solid"**

# ACE

*Drill Length* AND *Chucking*

# REAMERS

More holes faster . . . and at lower cost! That's what you want from a reamer, and that's what you get from Ace Drill Length and Chucking Reamers! They're made of pre-hardened H.S.S. and produced by the Ace "ground-from-the-solid" process. This gives them their highly polished right-hand spiral flutes . . . plus keener, longer-lasting cutting edges that produce smoother, more accurate holes. They're economical to use, too, particularly the drill length reamers. Because, with flutes nearly twice the length of chucking reamers, they can be re-ground more times for longer useful life. Next time you need reamers, ask your distributor for "ACE". If he doesn't have them, send coupon for complete details.

**ACE DRILL CORPORATION**
**Adrian, Michigan**

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

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COMPANY_____

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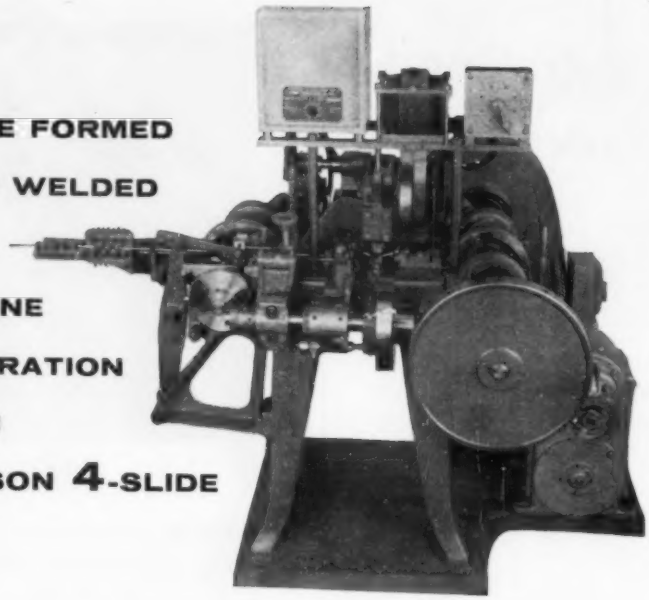


**ACE DRILL**
ADRIAN, MICHIGAN

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

INDICATE A-7-179-2

WIRE FORMED AND WELDED IN ONE OPERATION WITH NILSON 4-SLIDE





Garter loop formed and welded in one fast operation by Nilson 4-Slide.

Production is increased more than 25% by Hawie Manufacturing Company using a #1 Nilson 4-Slide with welding attachment which eliminates need for ferrule loops in the manufacture of hose supporters. .062 soft basic wire is formed with ends welded in one automatic operation at a conservative 105 pieces per minute. Additional savings are realized in eliminating cost of ferrule.



Another example — Drapery hook is formed with two wires entering 4-Slide simultaneously and automatically welded together at point of contact.

Nilson 4-Slides will produce many types of wire forms similar to the part shown here in which two pieces must be welded or otherwise closed together. By the mounting of automatic welding equipment on the 4-Slide, such parts can be produced in one fast, accurate operation at minimum cost. Nilson 4-Slide Wire Forming Machines are available in a wide range of sizes to handle basic steel wire from 1/32" to 1/2" diameter.

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Automatic Chain Making Machines • Staple Forming Machines • Wire and Stock Reels • Wire Straightening Equipment • Slide Feeds for Presses • Wire and Ribbon Stock Forming Machines

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the temperature was small. The author used seven different lubricants without finding a substantial difference in the temperatures. He warns, however, against a conclusion judging the lubricating qualities of oils by temperatures. He plans to continue his tests further in this direction. The piercing tool is not entirely covered by an oil or other lubricant, making possible measuring temperatures at places where the oil did not enter.

The welding of particles of the workpiece to the tool, which is similar to a build-up edge in turning according to the author, is due to the high temperatures at the hole. He indicates that a minimum temperature is required for the build-up, which for steel lies around 1000 F.

### Metal-Cutting Bar Stock

Certain similarities exist between metal-cutting operations and the break-in period for plain bearings according to an article in Issue No. 3, 1956 of *Werkstatt und Betrieb*. The author, R. Krause, indicates that in both instances fluids are fed into the system for cooling and lubrication. With a bearing, the main purpose is lubrication of the surfaces, while in metal-cutting, the cooling effect predominates, except in fine turning operations where the lubricating effect is of importance due to the fact that the surface finish depends on high cutting speeds and lubrication.

The author concludes that dry friction in metal-cutting must be transformed at least into boundary lubrication in order to obtain good results with high cutting speeds. A good cutting oil should therefore combine cooling and lubrication and satisfy other conditions such as high point of inflammation, absence of fog formation, etc.

In machining of bar stock, the combined effect of cutting fluid and alloys of the bar stock material accounts for high surface finish, ease of machining and high cutting speed. Special alloys were first developed in the design of plain bearings, while the main purpose of alloys in bar stock was originally for shortening the chips.

At first the addition of sulphur showed a change in the development of chips whenever large quantities were added; namely, ten times the normal sulphur content, 0.3 percent as against 0.03 percent. Later lead and cadmium were added to the steel, which showed substantially the same cutting temperatures although the melting temperatures of the sulphur alloyed particles is about three times as high as that of the lead and cadmium alloyed particles, 1800 F as against 600 F. In this case, it may be assumed that surface melting may occur during cutting, while in the author's opinion, no such melting may be

assumed in the case of sulphur addition. When alloying aluminum bar stock, it was possible to run the speeds up to nearly 10,000 fpm.

The author also discusses tests with electron microscopes and investigation of the chips for the three types of alloying elements. At high cutting speeds a certain amount of smearing action was found, similar to that occurring in the breaking-in of plain bearings.

He recommends tests materials with a lead content to avoid effects of poison in lead fumes which often evaporate readily. Such tests can be made within five minutes. The article contains three diagrams showing the effect of cutting speed on surface finish of nodular iron.

**Production Hardness Testing**

Increasing application is being made of testing hardness of workpieces between machining operations or before assembly according to a report by K. Potyka in the March issue 1956 of *Werkstatt und Betrieb*. Hardness testing stations are used in automotive industries, in chain manufacture and similar workpieces.

The author indicates that the transfer of hardness testing from the clean and quiet test room into the machine shop makes it necessary to take these differences into consideration in designing equipment for the job. On the production line the operation of hardness testing must not become a bottleneck, but work according to a cycle time. The time for hardness testing must obviously be reduced considerably from that commonly used in determining Brinell and other hardness values. The author recommends elimination of errors introduced into hardness data by the reduction of the time element, by means of correction data sheets.

Other difficulties which have been overcome are those of solid support for the tester and of load application. In workshops where cranes or presses are working, it is scarcely possible to obtain correct hardness data due to vibration of the supporting tables. Even shock mounts seldom help, in the author's opinion. He recommends hardness testers using springs instead of weights for load application; they are less affected by vibrations and also permit a shorter cycle time.

The article gives a number of examples of the use of hardness testers on the production line with their design and details of the support given the workpiece. Illustrations show hardness testing of cylinder blocks, crankshafts, valves, gears, rollers for antifriction bearings, etc. An automatic hardness sorter is described as well as a sorter for short cylindrical workpieces, a rotary table unit built into the tester and a tester attached to a planer.




**FINISHED AFTER HARDENING . . .**

**Hanson-Whitney**

**MULTIPLE THREAD MILLING CUTTERS**

Over 35 years of experience in designing and manufacturing top quality multiple cutters has established Hanson-Whitney first in the field. Hanson-Whitney's exclusive *finished after hardening* process provides extremely close limits in tooth spacing, form and relief. Ground thread cutters assure minimum outside diameter run-out . . . does not restrict the length of thread to be milled, while maintaining tolerances of parallelism or desired taper.

Hanson-Whitney Cutter Insert design, where applicable, meets today's demand for savings in tool costs. Hanson-Whitney Adapters, to suit cutter spindle tapers, accommodate Cutter Inserts. Adapters and Cutter Insert Blanks are carried in stock to expedite delivery.

Hanson-Whitney alone offers *single source* product integrity — machine tools, cutting tools, and precision gages for screw threads . . . your guarantee of production perfection. Consult Hanson-Whitney engineering service in the field or at home address. Write for further information and literature —

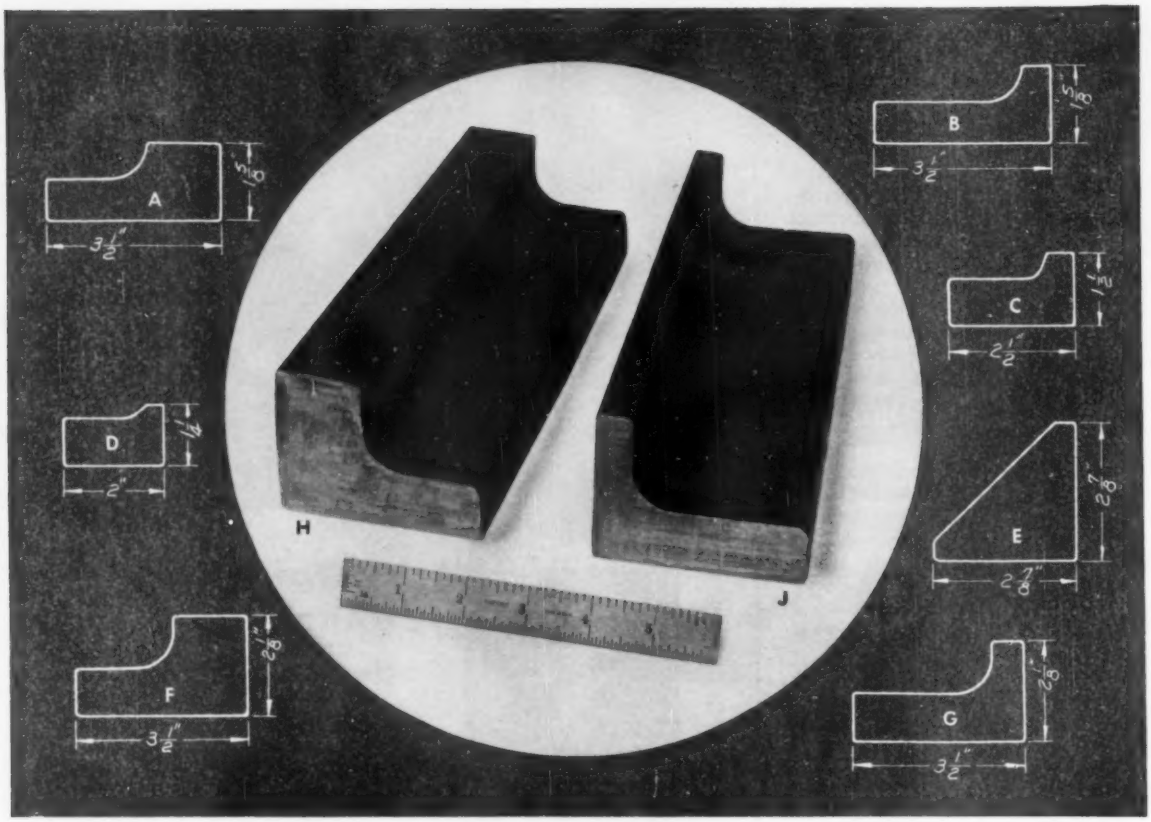
Hanson-Whitney COMPANY

DIVISION OF THE WHITNEY CHAIN COMPANY

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TAPS • THREAD GAGES • HOBS • CENTERING MACHINES THREAD MILLING MACHINES AND CUTTERS

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# UDDEHOLM Sectional Die Steel . . . in LARGE sizes

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Sections "H" and "J" photographed above are supplied in 10 to 12 foot random lengths, 3½" wide and 2⅝" high. Both are stocked in UHB Standard Quality Water Hardening Tool Steel, while section "H" is also stocked in UHB-46 Non-Deforming Oil Hardening Tool Steel. Machining qualities of either grade are excellent. Uddeholm's Swedish mills have rolls for all these sections—and the production facilities to give you their usual prompt and efficient service . . . Uddeholm also stocks over 2800 different tool steel combinations of grade, shape, size and finish. Just telephone us your needs.

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In Canada: Uddeholm (Canada) Ltd.
35 Coronet Road, Toronto 18, BElmont 3-3235

# FIELD notes

**Designer of** the best thermoplastic rod or tube application now in production or in tooling will be awarded a $1,000 prize as winner of a current contest sponsored by Cadillac Plastic and Chemical Co. Three second prizes of $150 are offered, one each in the categories of consumer product, industrial or technical product, and architectural or decorative. A parallel contest for students is offering prizes for the best student design with thermoplastic rod or tube, regardless of whether in sketch, or in production or imaginative exercise. Information on the competition, which closes September 30, 1956, is available from Ladd J. Orr, IDI, Design Contest Advisor, c/o Cadillac Plastic & Chemical Co., 15111 Second, Detroit 3, Mich.

V V V

**First issue of** "Lubrication Newsletter," technical company publication of The Alpha Molykote Corp. carries as its lead story a discussion of press fitting with molybdenum disulfide lubrication. The paper also includes an excerpt of proceedings of the First International Congress on Molybdenum Disulfide for Lubrication as reported by the German Mineral Oil Assn. Technical personnel who can make use of such lubrication information may be added to the mailing list by contacting the company in Stamford, Conn.

## expansions

**New England Tubular** Rivet, Inc. formed only a few months ago by the two former principals of The Milford Rivet & Machine Co., has expanded its operations and moved into larger quarters at 97 Buckingham Ave., Milford, Conn.

V V V

**Approximately $750,000** has been earmarked by the The Federal Machine and Welder Co. to spend during the next year to increase production facilities. Major part of the expenditure will be for new machinery, although some will go to provide increased floor space for certain departments.

**A new $245,000** roller hearth furnace and building have started operation at The Timken Roller Bearing Co.'s Gambrinus steel mill. Housed in a prefabricated galvanized building, the new furnace measures 150 ft 6 in. in length, 6 ft wide and 3 ft high. It can handle up to 4000 tons of steel per month. A fork lift truck is used to charge and discharge it.

V V V

**Completion of major** stages of a million-dollar modernization program have been announced by Long Mfg. Div. of Borg-Warner Corp. The facility, located at 12501 DeQuindre, is to prepare the division for manufacturing diversification in participation with the corporation-wide program.

**In a plant expansion** program that will more than treble the manufacturing facilities of its Sterling Die division, Pratt & Whitney Co., Inc. has announced plans to erect a unilevel factory in the suburban area of Cleveland. The facility, which will house both Sterling's administrative offices and its manufacturing operations, will be ready for occupancy about October 1.

V V V

**An extensive expansion** program, announced by Peninsular Steel Co., involves establishment of office and warehouse projects in Cleveland, Toledo, Dayton, Akron, Indianapolis, Grand Rapids and Buffalo.

V V V

**Construction of** a new building at 600 Bryant St., San Francisco, has been completed for General Controls Co. The new structure increases the San Francisco facilities by 120 percent.

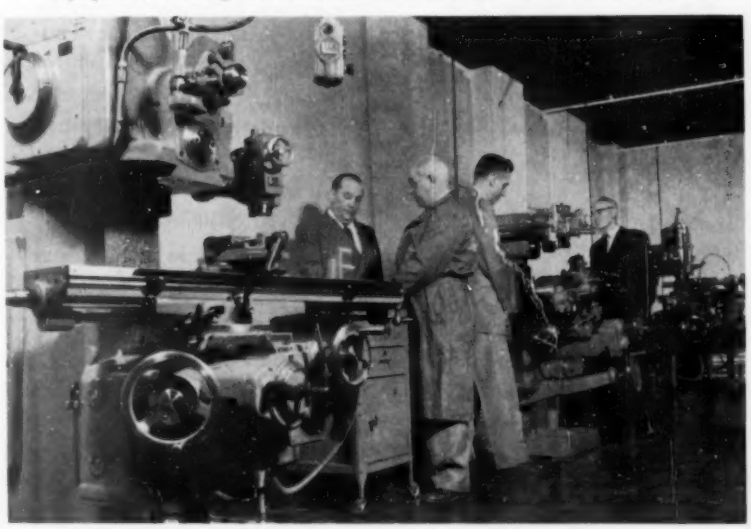
V V V

**First major step** of an extensive expansion and modernization program by American Bosch Arma Corp. has been completed with the dedication of a $1,164,000 addition to the Columbus, Miss. plant of the wholly-owned subsidiary, American Bosch Arma Mississippi

---

**Brown and Sharpe** Mfg. Co. has opened its new Precision Center where the complete line of B & S equipment and products will be permanently on display. Openhouse marked the beginning of activities which is designed to serve several purposes. Primarily, it houses equipment for the inspection of customers who may either have machines demonstrated or may try the operation themselves. It also serves as a training ground for one phase of the company's apprenticeship program, as well as providing a practical educational area for B & S distributors throughout the country.

**Equipment is being demonstrated in one corner of Precision Center.**



Corp. The addition more than doubles the size of the plant.

A second phase of the expansion is the half finished $1,500,000 modernization program underway at the American Bosch Div. at Springfield, Mass.

## new facilities

**Foundry activities** of Chambersburg Engineering Co. has transferred its operations to a completely new facility designed from information gained from 10 years' planning in order to obtain ultimate efficiency. The new plant incorporates the most up-to-date mechanical handling equipment and is designed for best utilization of floor space. Particular attention has been given to plant layout to carry flow of materials with maximum efficiency. Castings produced in the new foundry vary in sizes from 1000 to 150,000 lb. Degree of mechanization has been carefully controlled following an analysis made of the various foundry functions prior to construction to determine how much could be economically utilized without sacrificing versatility.

v v v

**An ultra modern** instrument plant has been completed by Leeds & Northrup Co. at North Wales, Pa. at a cost of $11-million. The facility, which houses manufacturing operations for automatic industrial instruments, provides a total floor space covering more than 6 acres. Because of the wide variety of products produced in this plant, mass production techniques have not been widely used. Emphasis has been placed on proper sequence and arrangement of operations, efficient tooling and other measures to assure economy of production and quality maintenance. About 1300 persons will be employed by the new plant.

v v v

**The West Coast** has a new plant making a complete line of grinding wheels with the opening recently of Norton Co.'s modern facilities at Santa Clara, Calif. Latest developments in the industry are incorporated in the new structure including automatic electric tunnel kilns, automatic molding machines for small diameter wheels, dust controls and modern handling equipment.

v v v

**Construction** of a production pilot plant for consumable electrode vacuum remelting of special alloy steels is being started by Universal-Cyclops Steel Corp. at its Research and Development Center in Bridgeville, Pa. The company has been experimenting with the process for more than a year and substantial production of ingots up to 16 in. diam. has been carried out with the cooperation of Mallory-Sharon Titanium Corp. The pilot plant will initially melt ingots up to 20 in. diam. weighing approximately 6000 lb. Rated capacity of the plant will be about 750,000 lb. of ingots per month. Delivery of the first material from the new unit is expected by the last quarter of this year.

v v v

**Handy & Harman** has installed new facilities for rolling precious and base-metal strip to tolerances as close as ± 0.0001 in. in strips 0.001 in. thick.

## new companies

**Auto-Air Industries** has been established to provide engineering services necessary for design and manufacture of automotive and aircraft tooling. Facilities for the new organization are located in Lansing, Mich.

v v v

**Formation of** a partnership to be known as the Owen-Brink Co. has been announced by the partners, James M. Owen and William J. Brink. The firm, formerly the James M. Owen Co., represents 12 national manufacturers of fasteners and industrial hardware and covers a sales territory including Idaho, Oregon, Montana, Washington and British Columbia.

v v v

**Formation of** Concord Control, Inc. in Cambridge, Mass. was recently announced. The firm is staffed mainly by specialists familiar with development




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INDICATE A-7-185-1

and manufacture of numerical control equipment for machine tools and industrial processes. Officers of the organization include James O. McDonough, president, Herbert P. Grossimon, vice-president in charge of engineering, and Richard W. Lawrie, vice-president in charge of sales. Mr. McDonough was project engineer for the numerical control projects at the M.I.T. Servomechanisms Laboratory.

## corporate changes

**Plans to acquire** the Hydraulic Press Mfg. Co. through statutory merger have been made public by Koehring Co. The transaction will amount to more than $5-million. Announcement, which was made by both companies, indicated a desire to jointly capitalize on recent individual efforts at product diversification. Both firms have in recent years successfully followed extensive expansion and diversification programs.

v v v

**WaiMet Alloys Co.** became a division of Consolidated Foundries and Mfg. Co. with the acquisition by Consolidated of certain assets of WaiMet Engineering Co. which have been merged with facilities of its Michigan-Standard Alloy Casting Co. to form an integrated operation under the WaiMet Alloys Co. The new division, with manufacturing, sales and research all centralized at 1999 Guoin St., Detroit, will specialize in production of Master alloys to custom. Roger F. Waindle, as president of WaiMet, is now president and general manager of WaiMet Alloys. Mr. Waindle is a past national president of ASTE.

v v v

**Borg-Warner Corp.** has acquired assets of Industrial Crane and Hoist Corp. Purchase was made with Borg-Warner common stock. Number of shares of stock involved in the transaction was not disclosed.

v v v

**New subsidiary,** Briney Mfg. Co., has been established by Goddard & Goddard Co. The new organization, which operated as a partnership under the Briney name for more than five years, will specialize in manufacture of boring heads.

v v v

**Assets of Allen** Mfg. Co. have been acquired by Chicago Pneumatic Tool Co. It will retain its original name while becoming a wholly owned subsidiary of Chicago Pneumatic Tool. Present personnel, company and sales policies will not be altered.

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**REPORT No. 5098B-3**

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Assembling carburetors was a slow, one-screw-at-a-time operation until AIR engineering solved the bottleneck. Now one operator uses this 8-spindle automatic Multiple Screw Driver to help turn out more than 6 completed carburetors per minute—400 every hour.

This compact, easy-to-operate Multiple Screw Driver is just one more example of how AIR engineering is helping modern industry solve problems and cut production time and costs.

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WATERHAMMER ANALYSIS—*by John Parmakian. Published by Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. Price $6.50. 175 pages.*

When a closed pipe is filled with moving water, the laws governing the changes of pressure and discharge depend upon the conditions under which the flow occurs.

If the water is considered to be incompressible and the velocity of the water remains constant, Bernoulli's energy equation applies. However, when the motion is unsteady, rapid pressure changes occur inside the pipe and Bermoulli's equation is no longer applicable. Such changes are referred to as "waterhammer" because of the hammering sound which often accompanies the phenomena.

The book is intended to meet the needs of the engineer who is primarily in the solution of waterhammer problems. The author covers a broad range of problems with a large number of graphs from which solutions can be obtained with little effort.

THE MMH MATERIALS HANDLING MANUAL—*edited by Val Laughner. Published by Boston Publishing Co., Inc., 795 Boylston St., Boston 16, Mass. Price $5. 384 pages.*

This book is edited for the materials handling specialists and engineers in all classifications of American industry. It is divided into seven sections as follows: (1) The over-all problems of handling; (2) plant layout and operation; (3) warehousing and indoor storage; (4) outdoor storage and yard handling; (5) pallets, unit loads and packaging; (6) shipping and receiving; (7) handling special shapes.

The MMH Manual contains over 400 illustrations and sketches, as well as a large number of tables and graphs. Material is written primarily from an engineering standpoint, with emphasis on methods as well as applications.

In addition to its use for industrial

materials-handling operations, it will find wide use as a college textbook.

TURBOBLOWERS—*by A. J. Stepanoff. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y. Price $8.00. 380 pages.*

This book deals with the hydrodynamic and thermodynamic aspects of the turboblower design. It outlines new methods of attack on turbomachine problems, and discusses the art of building turbocompressors in the United States and abroad. European designs occupy a prominent part of this book.

VAPOR-PLATING—*by C. F. Powell, I. E. Campbell, B. W. Gouser. Published by John Wiley & Sons Inc., 440 4th Ave., New York 16, N. Y. Price $5.50. 160 pages.*

This critical and authoritative book reviews the applications and techniques of vapor deposition of metals and nonmetals. The term "vapor-plating" has been used to describe both purely physical processes, such as vacuum-metallizing, and chemical processes, such as hydrogen reduction or thermal decomposition of metal halides of heated surfaces.

A unified picture on the art of vapor-plating is tempered by the authors' experience in many applications for which coatings of special characteristics have been required.

Discussions are given of the conditions required for the deposition of pure metals, carbides, nitrides, borides, silicades, and oxides from gaseous mixtures of their vaporized compounds.

The authors' aim to publicize the versatility of vapor-plating processes in an effort to stimulate their use as a flexible tool in many fields of technology.

BASIC LUBRICATION PRACTICE—*by Allen F. Brewer. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $6.75. 290 pages.*

This book contains information needed to choose and use the most effective lubricant for industrial and power plant machinery. Numerous charts and tabular data make possible quick comparisons of lubricants for specific machinery under various operating conditions. Those concerned with manufacturing will find this information of value in keeping production output up and maintenance costs down.

SERVOMECHANISM PRACTICE—*by William R. Ahrendt. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $7. 350 pages.*

This book developed from a need to supplement the theory in a college course on servomechanisms, with material on circuitry, electrical and mechanical components, and practical problems


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SIZE 5040T* TORSION BAR

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NEW accuracy and speed for precision nut running jobs...

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For torques up to 550 ft. lbs. a Size 5340T Torque Control Impactool is available.

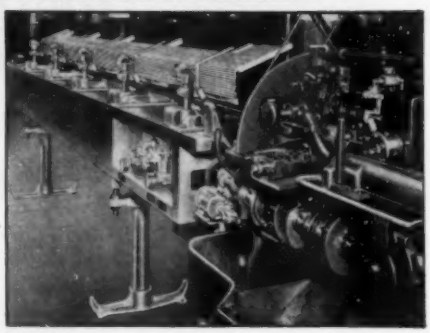
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Count up the time losses that occur in an average day with so-called automatic screw machines. Count shutdowns for feed finger adjustments, removal of jammed remnants, operator trips to the washroom. Count slow-downs caused by length-of-feed limits which require multiple-feed finger feed-outs. If you're realizing as much as 60% of gross geared production capacity, you're doing *well*—for feeding equipment that is not fully automatic.

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- Eliminates feed fingers . . . multiple feed finger feed-outs . . . feed finger adjustments and replacements. No jamming of remnants.
- No cutting air. No minimum or maximum run. No limit on length of feed. No selective stock length requirement.

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**Manufacturers of Automotive Clutches & Machine Tools**

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encountered in servo design and manufacture.

To make the book more useful, component values are given in the circuit diagrams. Tables of characteristics of typical components are also presented.

METALLURGICAL THERMOCHEMISTRY, 2ND ED.—*by O. Kubaschewski and E. LL. Evans. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $10. 426 pages.*

This monograph is intended for two classes of metallurgical chemists: the research worker and the process metallurgist, and reflects the still growing interest in the practical applications of chemical thermodynamics.

The extensive tables of thermochemical data of metal compounds have been brought up to date. Also recent experimentations have been incorporated.

PLASTICS ENGINEERING HANDBOOK—*by The Society of the Plastics Industry, Inc. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price $15. 852 pages.*

This second edition of the Handbook represents a compilation of the best engineering knowledge available on the processing of plastics.

The book contains 20 chapters, divided into 5 major sections: Materials and Processes, Design, Finishing and Assembly, Testing and SPI standards.

A chapter on Tooling with Plastics describes the newly developed uses of plastics in production tools for the aeronautical, automotive and other industries.

Users of plastics will benefit from particular commercial standards for the testing, rating, certification and labeling of plastic commodities.

PRACTICAL PLANT LAYOUT—*by Richard Muther. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price $12. 370 pages.*

A practical, how-to-do-it guide covering the essential elements of good plant layout. It explains the four basic phases—location, over-all layout, detailed layout plan, and installation—and discusses the eight fundamental factors influencing these operations.

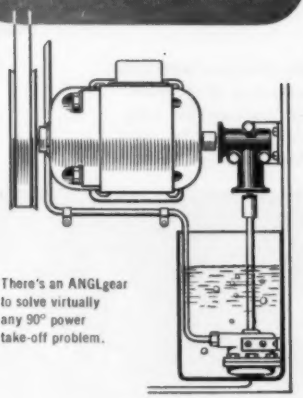
The book was written primarily for two groups: (1) men who are currently charged with the responsibility of making plant layouts and (2) men who have had industrial experience in areas other than layout, who must now learn about layout-planning work.

Directions are given for the practical steps of collecting data, organizing the layout and installing it.

The book concludes with a discussion of management's role in achieving good plant layout.

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ANGLgear comes in 1/3, 1 and 3 hp sizes, with 1-1 or 2-1 gear ratios and 2- or 3-way shaft extensions.

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*TM The Gleason Works, Rochester, N.Y.

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INDICATE A-7-189-1

# Readers' Viewpoint..

*To the Editor:*

Thank you very much for sending me tear sheets from the December 1955 issue of The Tool Engineer. It is pleasing to know that you liked my talk on "Training Plan for Executives" well enough to abstract it for publication. I think it is of particular interest that you feel that a talk on this subject would be interesting to a technical group. I am sure that more and more in the future, there will have to be a better exchange of ideas between technical people and those with broader interests so your inclusion of my paper is certainly a step in that direction.

As a matter of accuracy, I feel it should be stated that this program is a group effort by a majority of the Bell system companies and not the Bell Telephone Company of Pennsylvania.

*John Markle II*
*Vice President, Personnel*
*Bell Telephone Co. of Pennsylvania*
*Philadelphia, Pa.*

*To the Editor:*

I have just read with interest the article entitled "Automatic Aluminizing of Valves at Pontiac," which appeared in the February issue of THE TOOL ENGINEER.

We are extremely disturbed by the misrepresentation made by the most important piece of equipment used in this installation, the metallizing gun. Our company worked with Lindberg Engineering and supplied the Mogulectric metallizing gun for the aluminizing job. In Fig. 2 on page 80 you refer by trade name to our competitor, Metco, with a line sketch of their wire nozzle and air cap; also on page 81, right-hand column, you specifically state "Metco type metallizing gun."

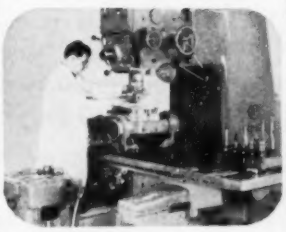
*R. E. Kunkler*
*Metallizing Company of America*
*Chicago 24, Ill.*

Naturally, we are very anxious to report facts accurately and without bias. The fact that the Mogul gun was not identified in the article stems from information obtained during the preliminary development stages. Although the article may appear misleading, a careful rereading will show that the sectional view of the metallizing gun was that for the experimental work. The gun is labeled properly according to our information.

We did not know that the production gun was a different gun; that is the reason for the apparent misunderstanding. We apologize for any misunderstanding that may result from our presentation. *ED.*

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readings in .00005" no gauges, blocks or bars

table sizes 44" x 24" 32" x 16"

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INDICATE A-7-189-2

# Automation in Stamping Production Illustrated on the U.S. MULTI-SLIDE®



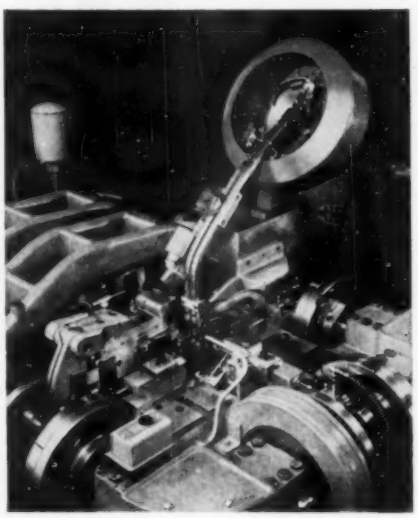
One of the aims of Automation should be the elimination, wherever possible, of secondary operations and handlings. You, like all manufacturers, are interested in attaining this result. The U. S. Multi-Slide can be the answer in the production of stampings.

The sequence-of-operations strip pictured above shows how a complete assembly is produced on the U. S. Multi-Slide without secondary operations. The finished assembly is an automotive fastener comprised of a sheet metal stamping and a nut. The stamping is produced on the U. S. Multi-Slide and the prefabricated nut is hopper-fed into proper position for automatic assembly. The complete unit is produced at the rate of 100 per minute – without handling.

The elimination of secondary operations results in reduced cost per piece, an all-important factor in today's competitive market. If you produce stampings and are interested in low piece part costs, why not investigate the use of U. S. Multi-Slide Machines?

**Ask for Bulletin 15-T giving complete specifications.**

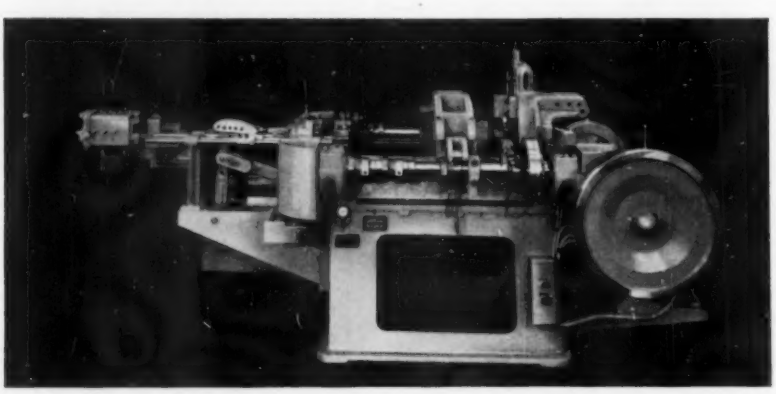
Below: Hopper feed unit mounted on U. S. Multi-Slide Machine for hoppering the nuts into position for assembly.



## U.S. TOOL COMPANY, Inc.

AMPERE (East Orange)
NEW JERSEY

Builders of U. S. Multi-Slides
U. S. Multi-Millers
U. S. Automatic Press Room Equipment
U. S. Die Sets and Accessories



Left: Standard No. 33 U. S. Multi-Slide Machine on which the hopper feed unit is installed.

# brainstorming for ideas

## new technique refined for planned invention, product improvement and production problems

Tech Digests

**Symposium from**
**Ideas, Inventions and Patent Conference**
**Cleveland Engineering Society**

NOTHING IS MORE IMPORTANT in business than ideas. While there is no scarity of them, at least on the management level, the difficulty is to apply ideas successfully to specific industrial problems such as product improvement, market needs, production and planning the company's future.

Viewed in this way there never are sufficient truly new ideas. Research and development work, for instance, can be considered as one method of producing planned inventions. Yet, only a small portion of the brain power of a company's personnel is ever fully utilized. Brainstorming is a method of taking advantage of the great creative potential available in any department of any firm.

Ideas are created in several ways: through inspiration, illumination or imagination. It is the latter process that is involved in the operation of brainstorming. A brainstorm session is a means of producing ideas through the use of imagination. But, it is more than that; it is a veritable chain reaction of ideas—an imagination "jam session."

In a brainstorm session, the participants "play by ear," using inventive and imaginative minds, together with other attributes of the improviser of jazz, to produce many new ideas, some of which may aid in the solution of the problem at hand.

The ground rules to a successful brainstorming session are few but vital. No negative or judicial considerations are to be permitted. The participants must not mentally weigh the value of any idea before proposing it. One person's words may trigger thoughts in the minds of others that will result in a worth-while idea.

The panel may consist of as many people as desired, though more than twenty will make it difficult to record ideas as fast as proposed and there may be some participants who sit back and let others carry the load. Thus, ten is suggested as the optimum number.

People selected for the session should at least be acquainted with the subject though there is an advantage in having various backgrounds represented to widen scope of the ideas. All participants should be on the same organizational level, since presence of a superior will tend to inhibit the free flow of new and imaginative ideas through the fear of appearing ridiculous or unrealistic.

The group must have an open-minded leader to define the problem and maintain strict adherence to the ground rules. He can also stimulate the flow of ideas by proposing one of his own or rephrasing the problem. He may record the ideas as proposed or a secretary may do this for him.

The statements should be reduced to one or two words if possible and written down where all the panel may readily see them. This is important since the visual image is a constant stimulant to the minds of the observers and will trigger release of associated ideas from their minds.

The brainstorm technique is being successfully used by many organizations to obtain problem solutions, new ideas for products, their design and manufacture, and even the trade name by which they are sold.

It can be used when broad concepts are needed to originate product development, or other design problems. For this it may be desirable to reduce the number of participants and allow more time for thought and communication. The basic rules of encouragement in collective thinking should be retained, however. Plenty of large paper and soft pencils should be made available, since design language is sketching and words. Design can be creative but perhaps not as startling in revelation as fundamental development.

In such a session entirely new approaches should be sought, but emphasis should also be placed on improvement and ramification of initial

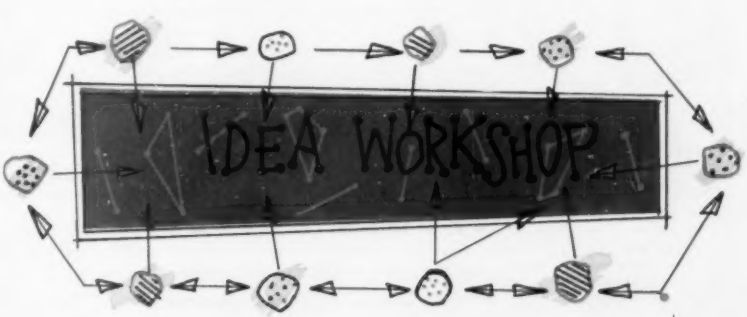
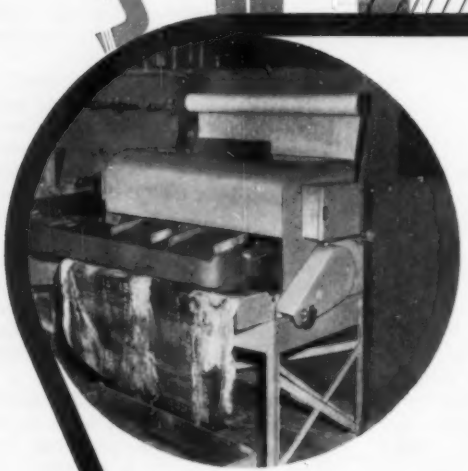



**Fig. 1. Brainstorm session elements are a conference table, panel of participants, a problem and time for unrestricted flow of ideas.**

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thoughts. This becomes a creative building process in which an entire product can be conceived in some detail. The judicial factor may creep into the mind of a participant but he is never to reveal his judgment except by constructively proposing an alternative.

Men selected for a design brainstorm session should be trained in engineering design technique but need not have similar experience background. Depending on the problem, the number may be as small as three. There is reason to believe that clearly patentable material will come from such a session. Sketch papers should be saved, dated and signed for patent purposes and evaluation.

Evaluation of worth of ideas depends somewhat on the kind of development program in which the problem originated. If it is a crash program, requiring



**Fig. 2. Advance Engineer, Ralph E. Parry, of General Electric sketches panel ideas on projector in demonstration of brainstorm technique.**

an immediate solution, then the list of ideas is quickly scanned and the ridiculous sounding ones, or those that appear difficult to implement in the light of knowledge and experience are discarded. Remaining ideas are compared against each other to determine relative worth.

Some may wonder, is this method worth the effort. Results from a wide variety of sources indicate it is. The method utilizes the wide experience and ideas represented by participants. Imagination has aided in compounding the ideas. A wider choice of tentative solutions has been presented in a shorter space of time than would have been possible through one person's efforts alone. Horizons have been widened and perhaps the one satisfactory solution is found that could not have been revealed in any other way.

This digest represents excerpts from "Freedom to Think" by Warren H. Chase, "How to get Ideas," by E. G. Reed; "Brainstorm Evaluation" by Ralph E. Parry; "How you can Use Brainstorming," by George Bramhall, all from the Conference on Ideas, Inventions, and Patents, Cleveland Engineering Society, April 1956.

# The Race of Productivity

**By Louis Polk**
**President**
**National Machine Tool Builders' Assn.**
**Cleveland, Ohio**

One well-known economist recently stated that America is now in the midst of no less than five revolutions:

First, in expanding population

Second, in technological advances in industry

Third, in consumer buying power

Fourth, in management techniques

Fifth, in planning both by government and business to make the most of these potentials.

Each of these items is in the direction of economic growth and expansion. Evidence of these trends is on every hand. The amazing population growth of this country since World War II, has upset most of the predictions of the past twenty years. Advances in medical science, increasing life expectancy, place an ever-increasing proportion of the population in the over 65 age group, and advance a constant trend toward lower retirement age, thus changing the character of the population.

What about the second revolution—the advance of industrial technology or, in other words, increasing productivity? Those familiar with the machine tool industry are well aware of advances that have been made in tool design for automatic mechanization. This is in principle, the marriage of two or more of the following: motion, machining, measurement and memory. Improved speeds, cutting tool materials, parts handling, lower operating cost and higher output are being provided in new machines in ever increasing measure. Corrective feedbacks are provided for greater accuracy and a means of producing better finishes.

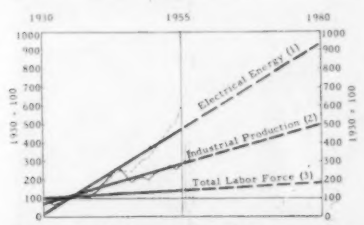
The third revolution concerns increased buying power of the public. This trend is well established in data of the U.S. Department of Commerce. They show that between 1947 and 1953, total family income in the U. S. rose almost 50 percent. The average family income rose about 30 percent as the number of families increased about 1/8 during that period.

The other two revolutions that have been mentioned, management techniques and government—industry planning, are present day developments in gearing the system of free enterprise to progress.

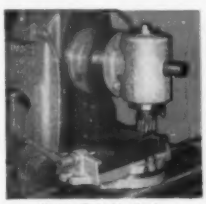
These five economic revolutions can be regarded as five facets of one big revolution in progress. Basically it is the revolution in technological advance which has paced the others. The economy is founded on the assumption of an ascending spiral of production. The problem is how to keep on turning out a constantly increasing volume of goods and services, and at the same time reduce the cost of these goods and services, in terms of real wages. The answer is rising productivity. That is, an increasing rate of production per unit of population. This is the race in which this country is engaged. A ruinous degree of inflation or rising prosperous productivity?

The course of this race is shown in the accompanying chart covering physical volume of industrial production, total employment and the output of electrical energy. The production index shoots up at about a 20 deg angle; employment index goes up more slowly, at 7 deg angle. The third line, charting ouput of electrical energy, zooms upward at better than a 30 deg angle.

Now projecting these lines over the next 25 years at the same slope, gives some surprising predictions. It shows that by 1980 to turn out the volume of goods and services shown will be diffi-




**Technological growth of past twenty five years projected through 1980. Yardsticks are electrical energy, production and the labor force.**



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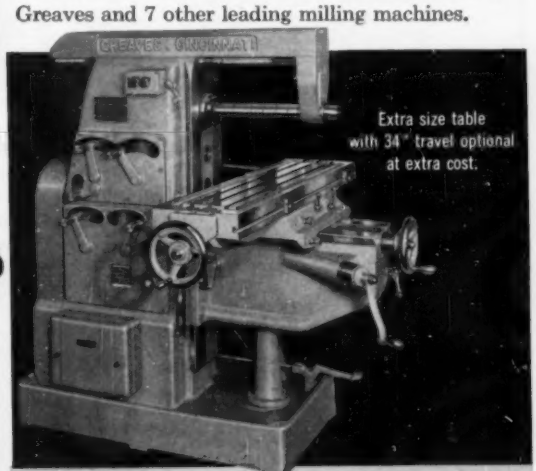

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## tech digests

cult on the basis of productivity and with the labor force available.

If the present ratio of workers in manufacturing holds good in 1980, industry will have only a little more than 22,000,000 to turn out an incredible production of perhaps 100 percent greater volume than today. Without new and better machines, the labor supply of the country will not be anywhere big enough to turn out all of the things people will want and will be able to afford.

Without increased productivity—the other revolutions of this time—cannot be served. With the ever-increasing prosperous productivity of industry, the inheritance of this way of life are limitless.

From a paper given at the Westinghouse Machine Tool Electrification Forum, April, 1956.

▼ ▼

# Methods of Machining Integrally Stiffened Structures

**By J. C. Borger**
**Production Methods Engineer**
**Lockheed Aircraft Corp.**
**Burbank, Calif.**

Integrally stiffened structures have proved to be the designer's answer to a more efficient aircraft. They are lighter in weight and integral tank sealing problems are reduced. In contrast with conventional design, an integrally stiffened structure is a one-piece part produced by extruding, rolling, forging or machining, or by combination, completely eliminating any form of assembly.

While such parts were conceived for the purpose of improving structural efficiency of compression panels, such as box beam surfaces, in design studies and actual applications, other advantages became apparent; particularly improved sealing characteristics for integral fuel tanks, aerodynamically smooth surfaces for skin design, production advantages because of reduction in number of parts and attachments and weight savings over conventional design. Machining these structures poses many serious problems. The large part sizes are a major factor, as they are as large as 4 by 32 feet, and

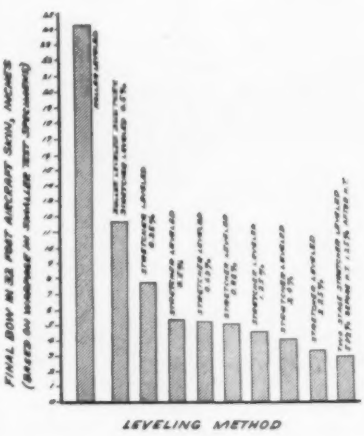
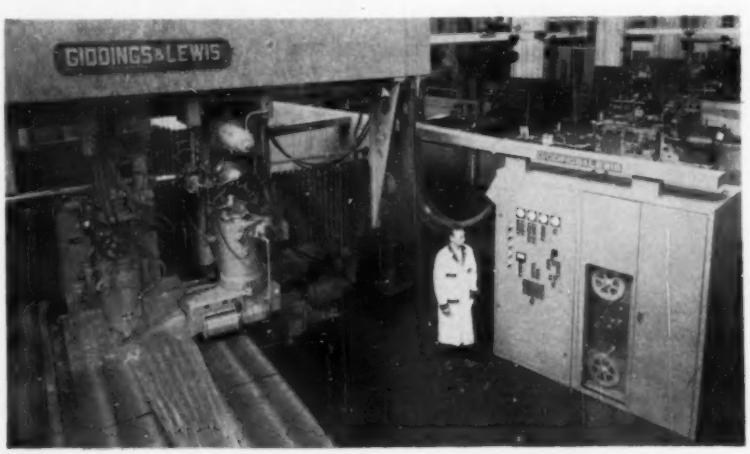



**Fig. 1. Effect of plate stock leveling on final warpage of large machine parts.**

**Fig. 2. Skin and spar mill developed for programming and tape control in machining integrally stiffened structural parts.**



some up to 50 ft long. As a result of a series of tests to reduce warpage, considerable data was finally secured, *Fig.* 1, to set up material specifications.

From the results, it was decided to use a two-stage stretching operation, for processing material for this type of part. The operation consists of a 5 percent permanent set before heat treat and a 2 percent permanent set after heat treat. In most cases, the final bows in the production machine skins were less than the bows of experimental two-stage stretcher leveled specimens, and in no case was the final bow greater.

In addition to the materials problem, the mechanical problems of the machining operation have been met by new equipment such as the G & L skin mill with the tape control system. This equipment has eliminated the inherent errors in earlier machines, namely:

1. Deflection problem in the mechanical feedback system
2. Overcontrol from high feed/speed and control system deflection
3. Inaccuracies in cams and cam indexing methods which have been eliminated in the new system
4. Human error in positioning and setting cutting heads. These have been eliminated since all positioning is controlled by the tape.

Great progress has been made in manufacturing integrally stiffened structures. In conclusion, the airframe industry is using plate with controlled stretching to reduce residual stresses. Machine tools for extreme accuracies at the high speed required for this type of machining are available. Floor-to-floor time, weight, part spoilage and costs have been reduced.

From a paper "Progress in the Machining of Integrally Stiffened Structures From Plate" given at the 1956 spring meeting of the ASME, 29 W. 39th St., New York, N.Y.

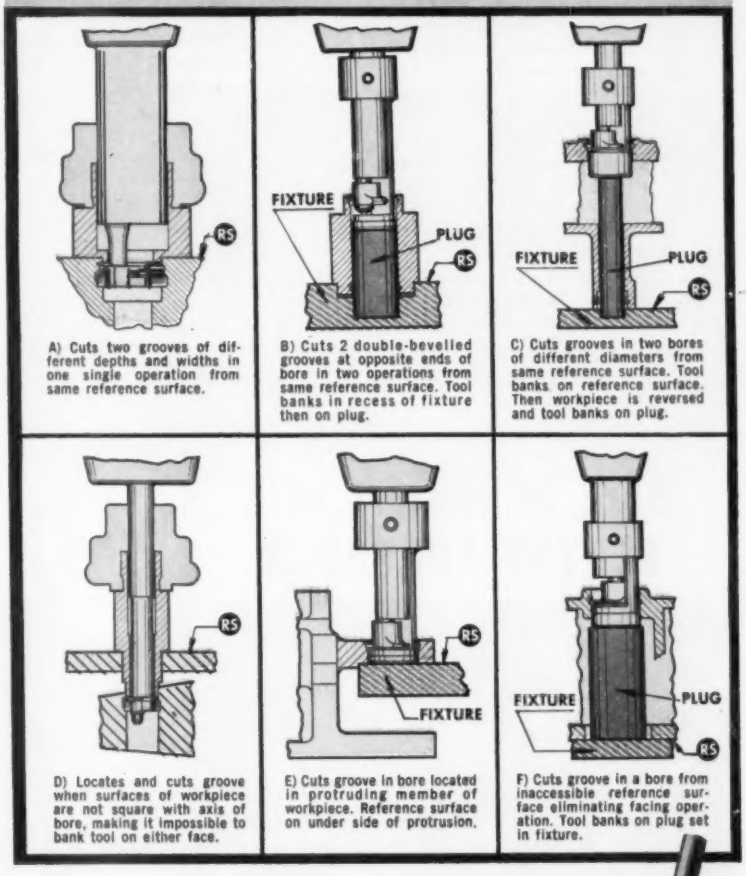
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## Action of Grinding Fluids Revealed by Research

**By R. O. Lane**
**Jackson, Michigan**

Contrary to popularly held opinion, results of recent research at the Mellon Institute show that in terms of generally recognized functions of grinding fluids, lubrication is more important than cooling. These and other findings are reported in a paper "Influence of Grinding Fluids upon Residual Stresses

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D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

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in Hardened Steel" by Dr. H. R. Letner, presented at the ASME annual meeting (No. 55-A-123). The research was sponsored by the Grinding Wheel Institute and Abrasive Grain Association in a program to determine effects produced on metals by grinding.

The effects have been carefully analyzed, using 13 different fluids. The results suggest that the effectiveness of a fluid in minimizing residual grinding stresses depend not so much on the heat releaving capacity of the fluid as the degree of lubrication furnished between wheel and work.

Grinding experiments were performed in the following media: air, concentrations of rust inhibitor in water; water miscible oils (soluble oils); straight grinding oils. Steel used was of a ball bearing type, AISI-52100.

Although wheel, feeds, speeds and work material used are typical of conditions found in commercial practice, no claim of generality beyond the scope of the present experiments is made for the conclusions:

1. Stresses obtained with water solutions of rust inhibitor or miscible oils differ little from those resulting from dry grinding.
2. Some reduction in magnitude of peak tensile stresses is indicated by certain straight grinding oils.
3. Straight grinding oils are conducive to high compressive stresses close to the surface.
4. Effectiveness of a grinding fluid, as far as residual stresses are concerned, depends upon its ability to reduce thermo and mechanical stresses during chip formation, rather than upon its ability to carry heat away from the cutting zone after it has been generated.

Thus, in terms of generally recognized functions of grinding fluids, lubrication is more important than cooling. In fact, if the benefit derived from a grinding fluid, such as sulfocholorinated mineral oil, is due to a reduction in the thermo component, it must come from reducing the amount of heat generated rather than carrying it away later. This view is consistent with previous observations, based on single point machining experiments. These indicate an appropriate gaseous atmosphere, incapable of any appreciable cooling action in the sense of carrying heat away from the cutting zone, can reduce friction and improve surface finish to a degree comparable with most effective liquids. In metals, at least, the workpiece apparently absorbs the surface heats so rapidly that any subsequent cooling by the fluid is of minor importance.

From a summarization of ASME paper No. 55-A-123, for the Grinding Wheel Institute, 2130 Keith Building, Cleveland, Ohio.

▼ ▼ ▼

## How to Use Suggestions in Small Shops

**By Alan H. Mogensen**
**Work Simplification Conferences**

Instead of automation and electronic devices small shops must look to its employees for improvements and cost reduction. Old methods of trying to get results from people have not worked out too well. A suggestion box which is in the minds of manufacturers as a solution to the problem has not worked.

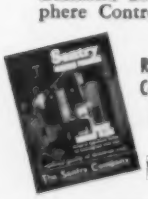
One study prior to WW II showed that 95 percent of the suggestions that had been tried had failed; 25 percent acceptance is considered a high rate. To be effective a work simplification program must include every single person in the company. It must start at the top and management must believe in the philosophy of the program. Difficult problems can be reduced to simple steps and management can control efficiency of operation by stimulating employees to be constantly alert for possible improvements. There must be a desire to solve the problem. The

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people need to get into the act and understand some of the problems of the business. They need to see the need for cost reduction and method improvement. Then it is simply a matter of finding out what is going to make them want to do it.

Most of all the worker wants to see his idea in and working. He wants recognition for ideas. In some industries, the name of the individual who proposed the idea is affixed to every physical improvement. Another thing necessary is ability to solve the problem. That comes through training.

Finally there is the capacity to handle the human relations problem. Resistance to change and resentment of criticism must be overcome if such a program is to be effective. Let a change be the worker's idea and the program will have his full support. Tremendous improvement in productivity is achieved through work simplification programs by this change in attitude and morale of the worker. That is what will change 80 percent rejections to 80 percent acceptance.

From a presentation given at the American Material Handling Society Technical Session, June 1956, (Material Handling Institute, Inc., Suite 759, One Gateway Ctr., Pittsburgh 22, Pa.)

▼ ▼ ▼

## Projection Welding Hardware to Steel

**By O. K. Barnes, Jr.**

**Westinghouse Electric Corp.**
**Pittsburgh, Pa.**

An extensive program of developing schedules for welding projection hardware to low carbon steel has recently been completed. Welding of typical hardware items such as pilot nuts, brackets, angles, bolts, weld screws, spacers, pins and tee nuts is covered in the discussion.

Sheet and plate thicknesses to which the items are welded range from 0.032 to 0.250 inch inclusive. A number of important factors are considered, including minimum number of electrode sizes and combinations required to weld all hardware types; correct joint design; value of instrumentation in maintaining consistent weld strength.

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From a paper given at the American Welding Society National Fall Meeting, Oct., 1955, Philadelphia, Pa.




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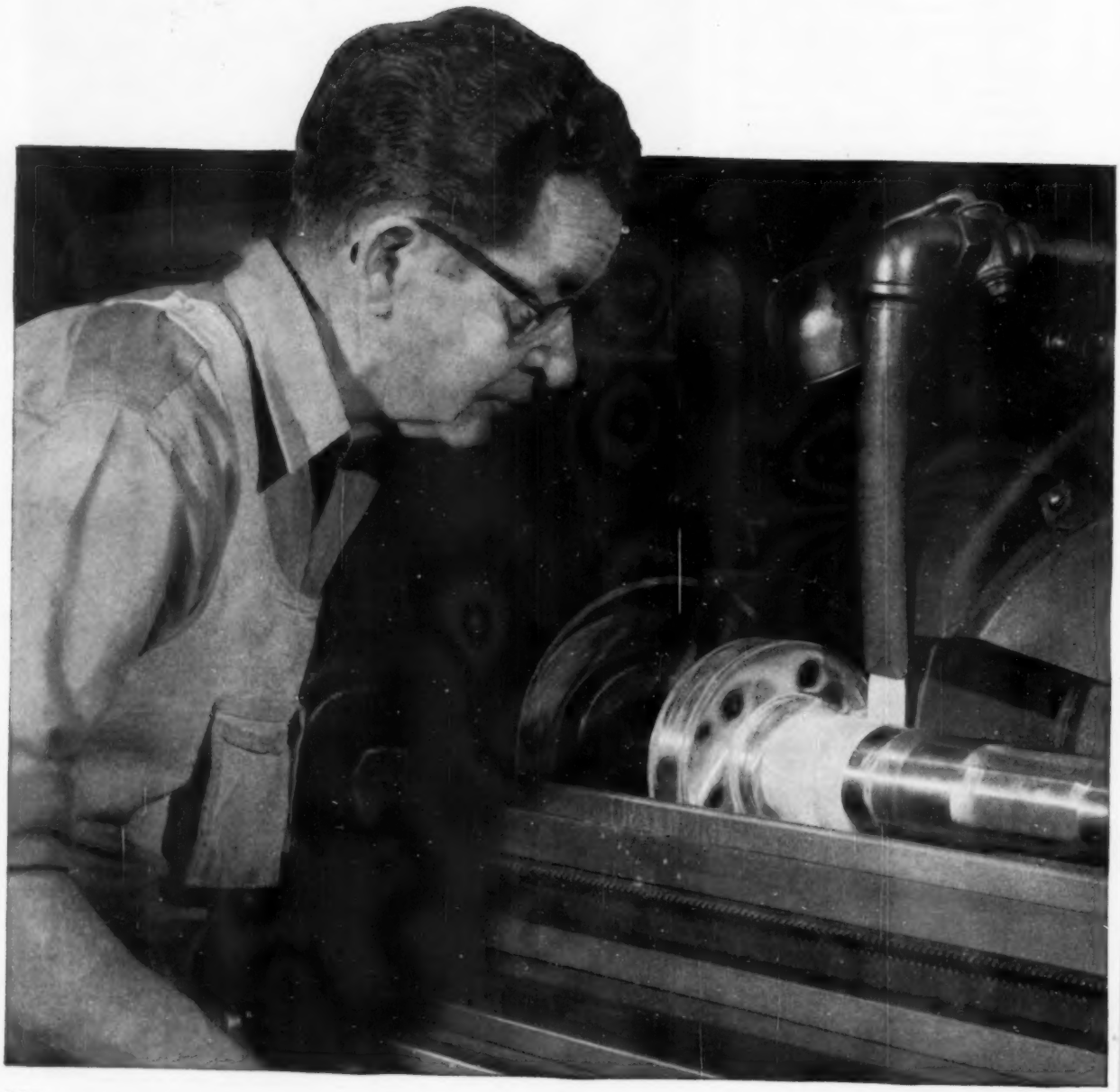
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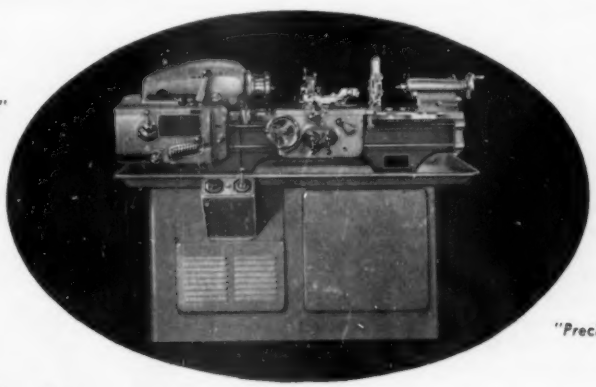
One of our men is grinding a spindle in the picture on the opposite page. It's the *care* he uses in determining wheel speed, feed, speed of work rotation, coolant flow, and wheel selection that makes the difference between a good spindle and a superior one. Experience tells him the proper relationship of these factors to the type of steel used in the spindle and the degree of hardness to which it has been processed.

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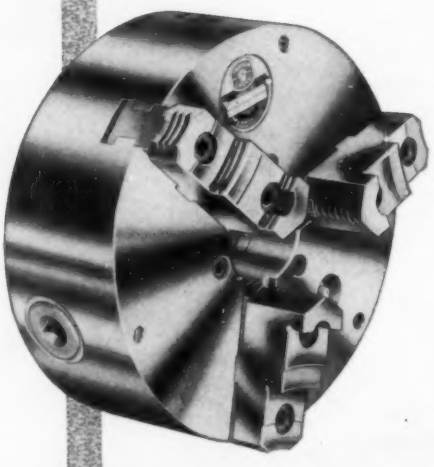
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**This is the NEW Hendey 32-Speed Geared Head Lathe which represents the finest in accuracy and production, in keeping with Hendey's long-standing reputation for the finest in lathes. Write the Hendey Div., Barber-Colman Co., Rockford, Ill., for complete information on this outstanding new lathe.**

# *deserve the finest precision chucks*



**This is Horton's standard 3-Jaw Scroll Universal Chuck which has contributed to Horton's reputation for chuck leadership for over 100 years. Its precision and lasting accuracy make it a must in any production picture. For the complete story on the complete line of Horton Chucks, see the Horton people in your area now.**

HORTON CHUCK
Since 1851

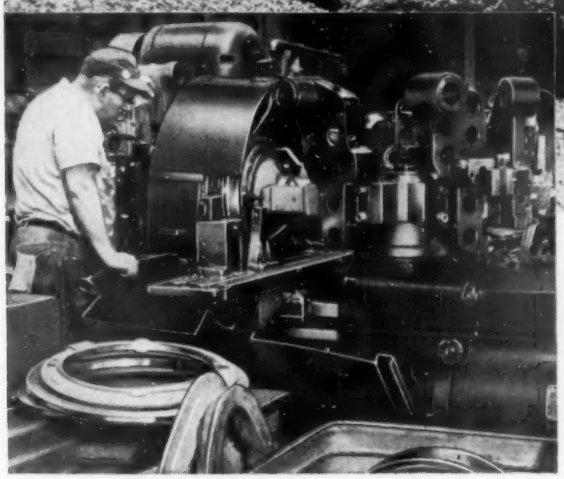
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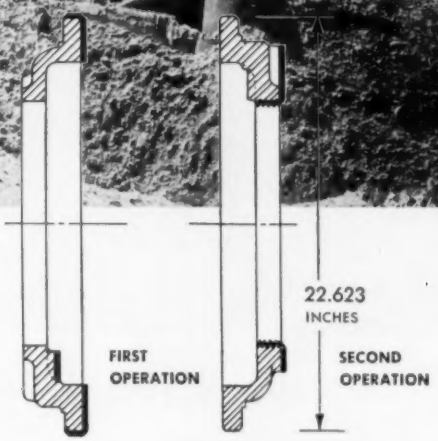


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# HELPING THE GIANT CAT *
# CHANGE THE FACE OF THE EARTH








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## The POTTER & JOHNSTON 6-DRE-40 Automatic

**NAME:** *Bracket Flywheel*
**MATERIAL:** *Steel Casting*
**REQUIRED:** *2 Automatic Cycles involving several precision cuts AND A 15½" – 12 N F THREAD!*

## Chucking Turret Lathe Produces BIG parts like this QUICKLY, ACCURATELY and ECONOMICALLY

Virtually "changing the face of the earth" is a rough, tough job that takes rugged, built-for-the-purpose equipment like the famous CATERPILLAR Tractors. And turning out component parts for these mighty marvels is a tough job too . . . one that calls for the rugged power, extra rigidity and all-round versatility of a machine like the POTTER & JOHNSTON 6-DRE-40 Automatic Chucking Turret Lathe. **Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.*

If *you* have difficult machining jobs – and who hasn't in these days when complex parts must be produced fast – why not borrow a page from the CATERPILLAR success story. Depend on a POTTER & JOHNSTON AUTOMATIC. Get started today . . . write for full information on the P&J 6-DRE-40 and on the other Automatic Chucking Turret Lathes in the complete P&J line.



Bulletin No. 159

*Precision Production Tooling for more than Fifty Years*

## POTTER & JOHNSTON COMPANY

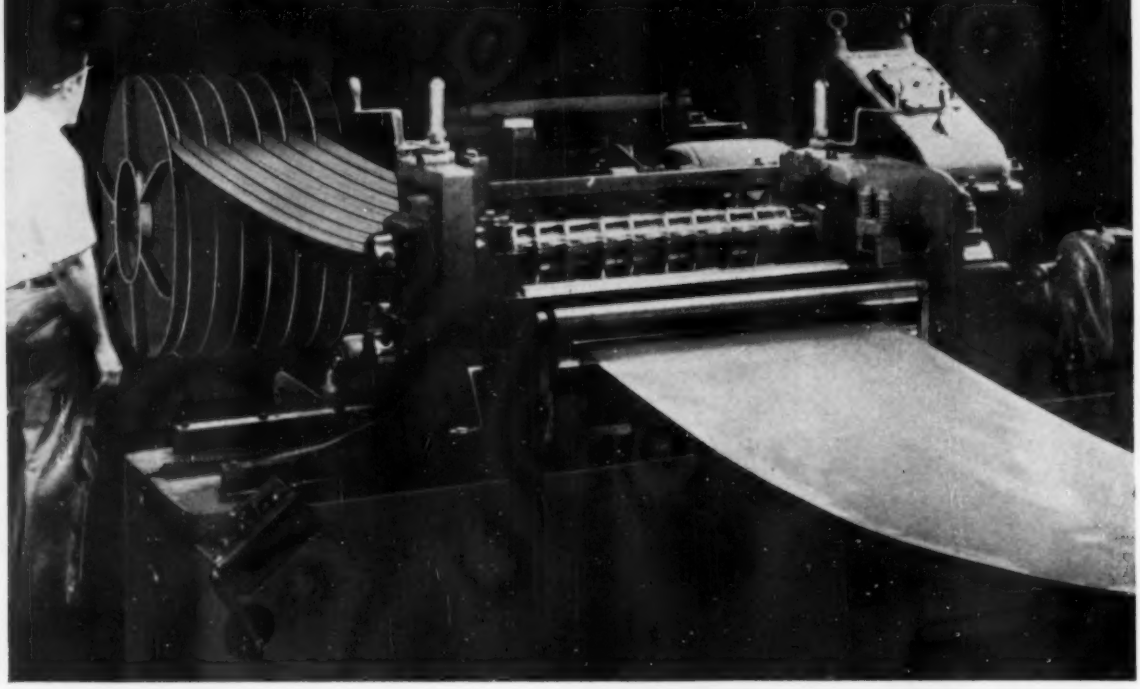
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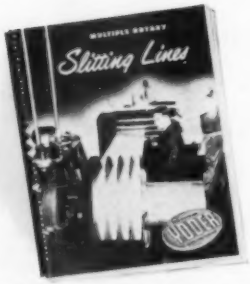
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## ...with big savings possibilities




The Yoder Slitter Book contains time studies, production records, and other valuable data on the economics as well as mechanics of slitter operation. A copy is yours for the asking; also estimates and recommendations.

The standardized series of Yoder Uncoilers, Slitters and Recoilers make possible an infinite number of combinations for highly efficient coil and sheet slitting.

At a substantial saving in first cost, one of these combinations will meet widely varying production needs of fabricating shops as efficiently as higher priced, built-to-order equipment (also designed and built by Yoder) for very big tonnage requirements.

A Yoder standardized slitting line is a most profitable production tool which will pay for itself in short order on strip requirements as low as 100 tons per month, even less. Equally important is the ability in a few hours to meet expected and unexpected needs for slit strands, from a relatively small stock of standard width coils. This greatly reduces strip inventories and simplifies production planning.

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**ROTARY SLITTING LINES**
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## √Check and √√Double Check

Pitch diameter of plug thread gages is best measured by laying super accurate "wires" between threads at opposite sides and taking a reading over the wires on an instrument set to gage blocks.

But even gage blocks wear undersize with use. That's why "Greenfield's" master set is never used to set an instrument. It is used only to calibrate reference blocks which in turn calibrate the "working" blocks.

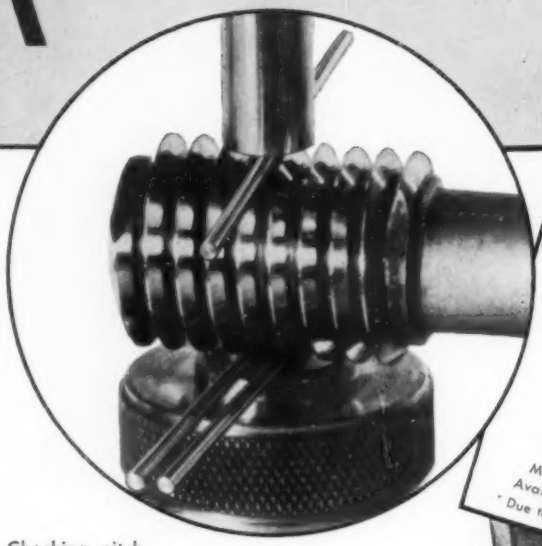
Key to this system of check and double check is a calibration sheet recording the known deviation of each setting block in millionths of an inch. This deviation is applied to the instrument reading to assure the most exact possible measurement.

Gage inspection at GREENFIELD involves many other meticulous, time consuming checks in a constant temperature room where gages are "acclimated" at least six hours before measuring.

**GREENFIELD TAP and DIE CORP. GREENFIELD, MASS.**

# VK THREAD MEASURING WIRES

## ▼ Standard equipment everywhere



Checking pitch diameter of thread gage by three wire method on VK Light Wave Micrometer.




Every set of VK Standard Thread Measuring Wires, in addition to being within .000020" of best size, is now calibrated and furnished with matching constant. In many cases this will result in considerably more accurate pitch diameter measurements. These wires are the accepted standard equipment for making pitch diameter measurements of taps, thread gages, precision threaded parts, hobs, worms, splines and gears. For the great majority of 60° Unified and American threads, the Set No. 20 H.S. pictured at the right will fill your needs. Similar sets to ± .000020" accuracy are available for single-start threads of other pressure angles. For threads which have a lead angle greater than five degrees, or multiple-start threads and worms, special size wires should be used.

### *Set No. 20 H.S. Thread Measuring Wires*

Set No. 20 H.S. Thread Measuring Wires is a plant necessity for maintaining taps and thread gages within their limits for wear and for proving the pitch diameter of screws and threaded parts.

Price, High Speed Steel Wires....$135.00

Special wires from .002" to 2.000" diameter are made to any tolerance required.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

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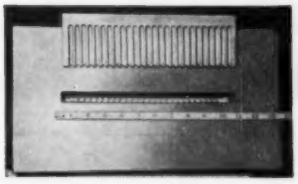
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grinding this single point tungsten carbide tip boring tool.



**WE SAVED 16 HOURS**

plus 9 different operations on this form grinding of a carbide broach.



**WE SAVED 379 HOURS**

on the machining of this die casting die.

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*T.M. Reg.



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## and precision performance

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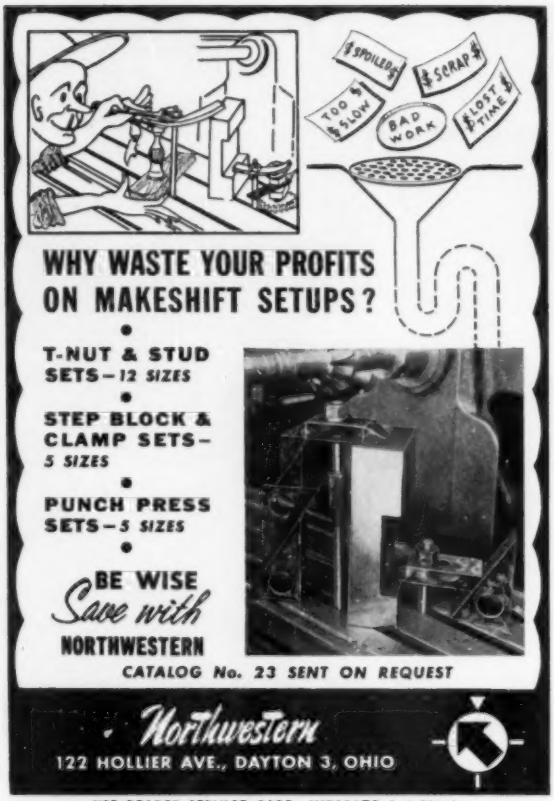


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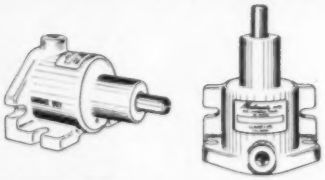
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**UNIVERSAL MOUNTING** for easy vertical or horizontal installation.
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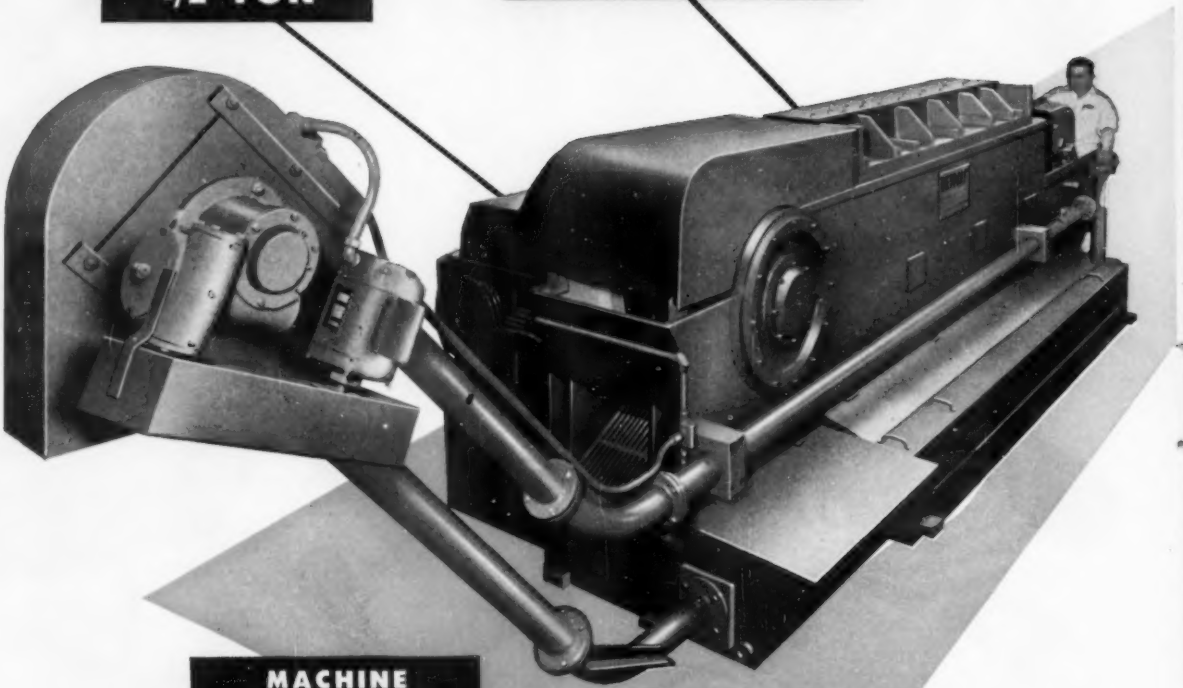
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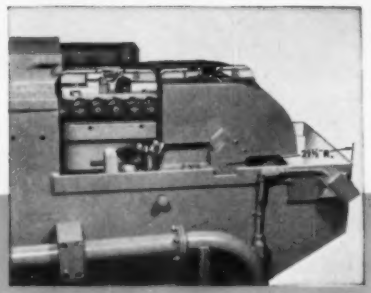
# NEW DETROIT Continuous

BULL GEAR
1/2 TON

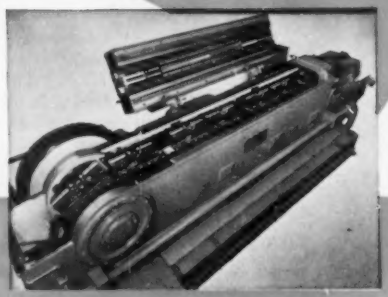
BROACH TUNNEL
13/4 TONS



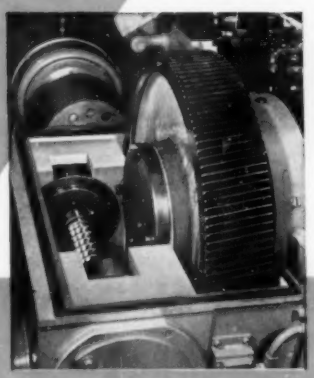
MACHINE
171/2 TONS



Note generous radius from chain axis to outer machine frame, 22½" at loading end, 23½" at unloading end. This assures easy, safe handling of wide variety of work sizes and shapes.



Broach tunnel raised to show heavy duty twin chain type drive and automatic hammer lock fixtures. Tunnel and broaches weigh 3,750 lbs., while entire machine weighs 35,000 lbs.



Massive ½ ton bull gear provides positive pulling power and smooth operation required for extremely fine finishes. Gear is directly connected to main drive drum.

# BROACH
# Horizontal Machine

**WEIGHT** *where you want it!*

**ROOM** *where you need it!*

Extreme weight and rigidity are the answers to high-production surface broaching with fine work finishes and long tool life . . . and this husky new Detroit Continuous Horizontal gives you *the most you can get!*

## PLUS

- Generous loading and unloading clearances for easy, safe handling of a wide variety of work.
- All-welded, heavy steel plate frame.
- Fully automatic fixture locking, machine operation and unloading.
- Safety interlock assures proper work positioning before operation.
- Heavy-duty, twin chain electric-mechanical drive.
- Simple change gears for varied cutting speeds.
- Entirely self-contained, including automatic chip disposal unit.
- Electric and hydraulic equipment to J.I.C. standards.

***Model illustrated is 90" stroke 15-ton capacity with cutting speeds to 40 f.p.m. Other 15-ton models available with 66" and 120" stroke, lower and higher tonnage capacities on request. Send part prints for prompt recommendation and quotation, or mail coupon now for free descriptive literature.***

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- ☐ Broaching Tooling




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TITLE_____

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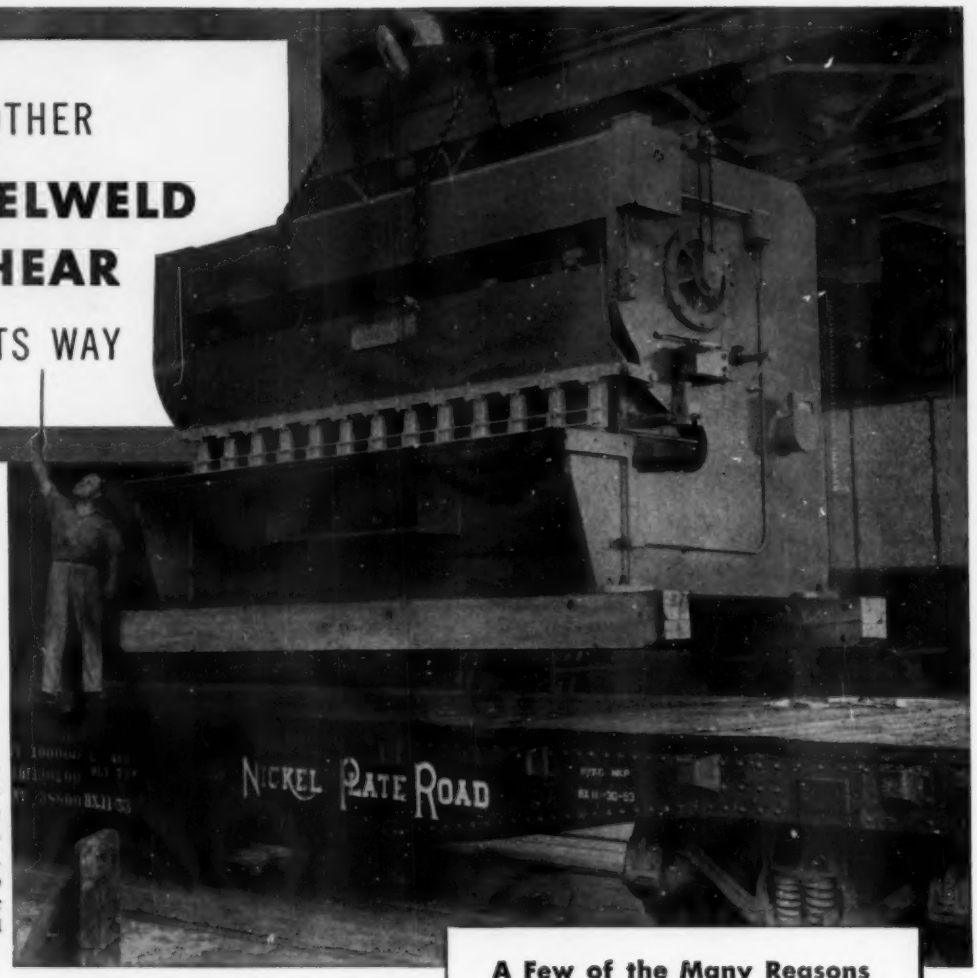
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**STEELWELD SHEAR**

ON ITS WAY




From every angle a Steelweld shear looks good — and is good. This machine is rated for 12'-0"x½" steel

SHIPMENTS are being made at a rapid rate to all parts of the country because more and more users are learning of the many merits of Steelweld Shears and are talking about them. As the words of experience spread about and comparisons are made, more and more people come to realize that Steelweld Shears are really outstanding.

For smooth, accurate burr-free cutting, Steelwelds can't be beat. For ease of operation they have no peer. Their heavy construction and means for simple, easy maintenance assure long trouble-free life.

For the finest in shearing, you can't make a better selection than Steelweld. Say the word and we'll have one of these wonderful machines on the way to you.

### A Few of the Many Reasons For STEELWELD'S DEMAND

1. Pivoted-blade operation. Entirely different from every other shear. No slides or guides to wear and cause inaccuracies.
2. Micro-set knife adjustment. Quick easy knife-clearance adjustment for every plate thickness. Something not matched elsewhere. Be sure to get the complete story on this.
3. Mechanical hold-downs. Tight gripping, non-leaking, quiet operating.
4. Accurate easy operating back gauge rides on ball bearings.
5. Cool-operating, long-life, low-inertia clutch and brake.
6. Heavy all-welded rigid one-piece steel frame.

**AVAILABLE FOR PLATE LENGTHS TO 24 FEET AND THICKNESSES TO 1½ INCH**



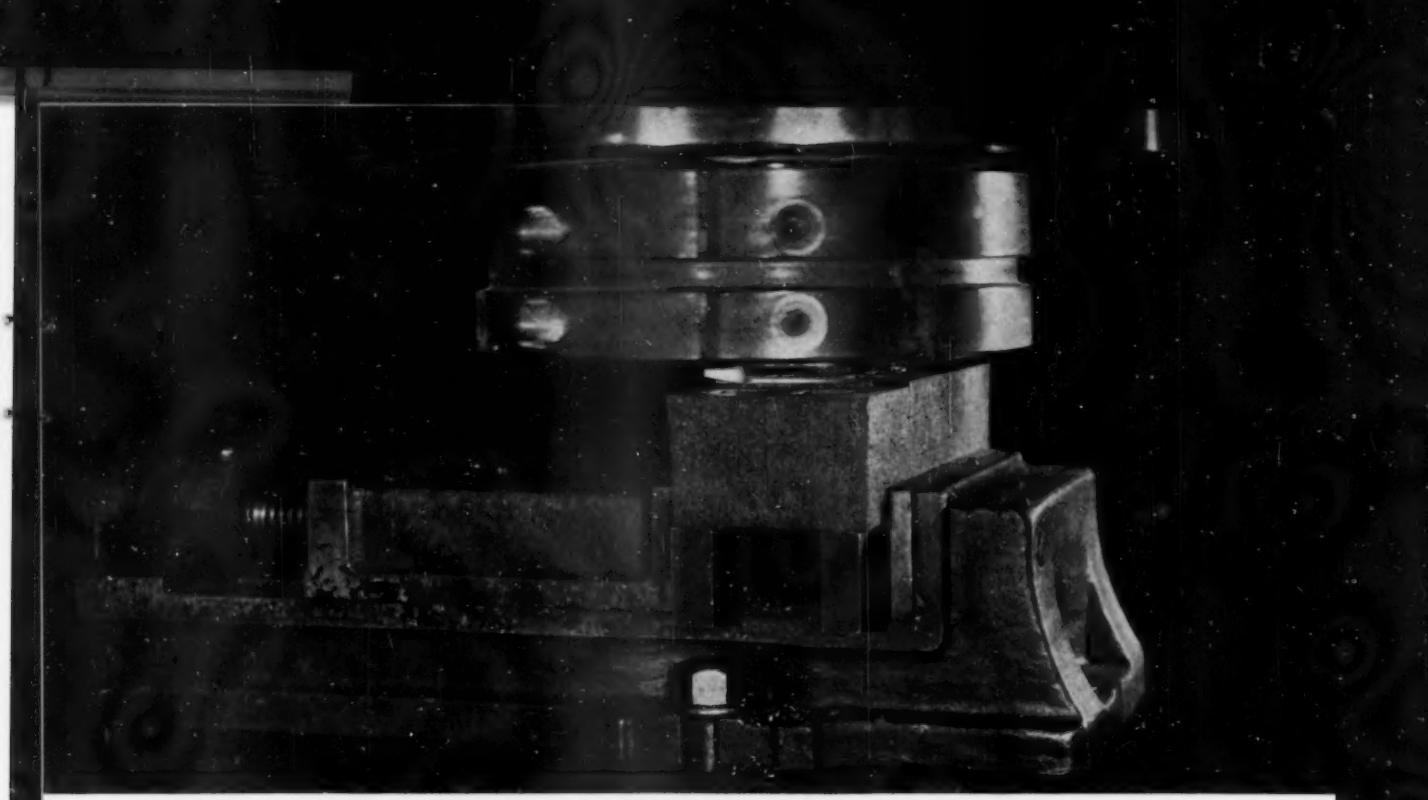

*GET THIS BOOK!*

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

8551 East 282 Street, Wickliffe, Ohio

**STEELWELD PIVOTED BLADE SHEARS**



Grade 860 – .012" wear, no chipping



Grade "A" – .035" wear, some chipping



Grade "B" – .025" chipped



Wear land comparison tests prove Grade 860 provides greater resistance to chipping, cratering. After milling 72¾ lineal inches on a cast-iron block with interrupted cuts to simulate cylinder blocks, wear on Grade 860 is minute. Two typical carbides tested under identical conditions show extensive chipping. **Speed** – 377 fpm. **Feed** – .0096". **Table travel** – 1¼ ipm. **Depth of cut** – .100".

## On high-tensile gray cast irons . . .

# TOUGH, NEW CARBOLOY MILLING GRADE 860 GREATLY REDUCES CHIPPING AND CRATERING

Carboloy® Milling Grade 860 was specially developed to provide longer tool life on the harder, denser types of gray cast iron now coming into common use.

Stronger cutting edges make Grade 860 far more resistant to chipping and cratering than any other available carbide. Tougher internal structure provides longer tool life and more production per grind.

**Improves production 20-30%**

Carboloy Grade 860 has been tested for almost a year on high-tensile cast irons ranging from 223 to 248 Brinell hardness. Despite scale and interruptions, this new carbide has consistently outperformed ordinary grades by 20-30%.

At speeds ranging from 250 to 300 fpm, Grade 860 produces excellent finishes. It is especially efficient for face milling operations, and can also be used to advantage for plain milling.

Specify new Carboloy Grade 860 for your milling cutters. For more details or technical information, write today . . . or mail the coupon on page 4 of this advertisement.

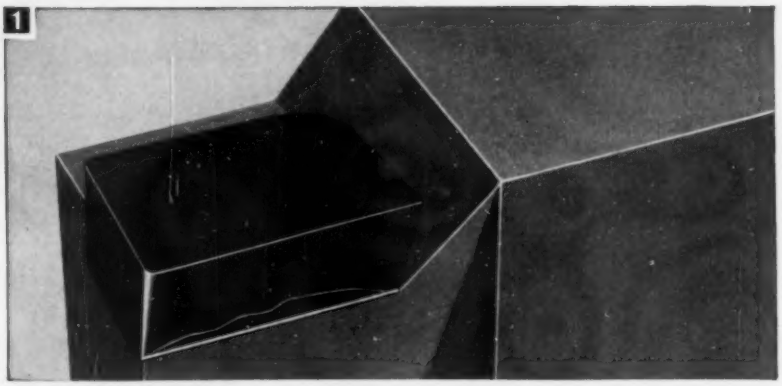
**CARBOLOY**

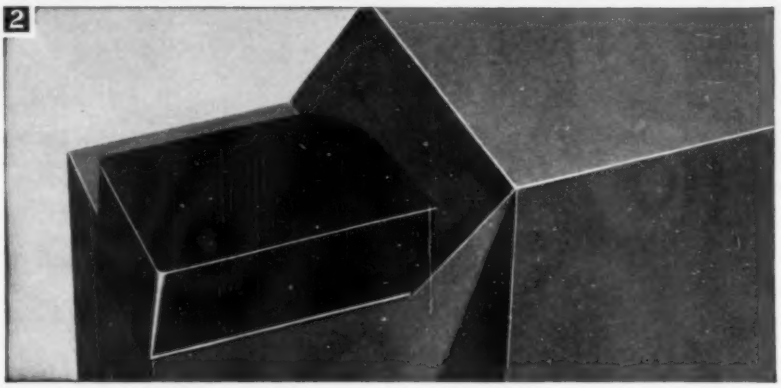
DEPARTMENT OF GENERAL ELECTRIC COMPANY

**BRAZING CRACKS ELIMINATED**

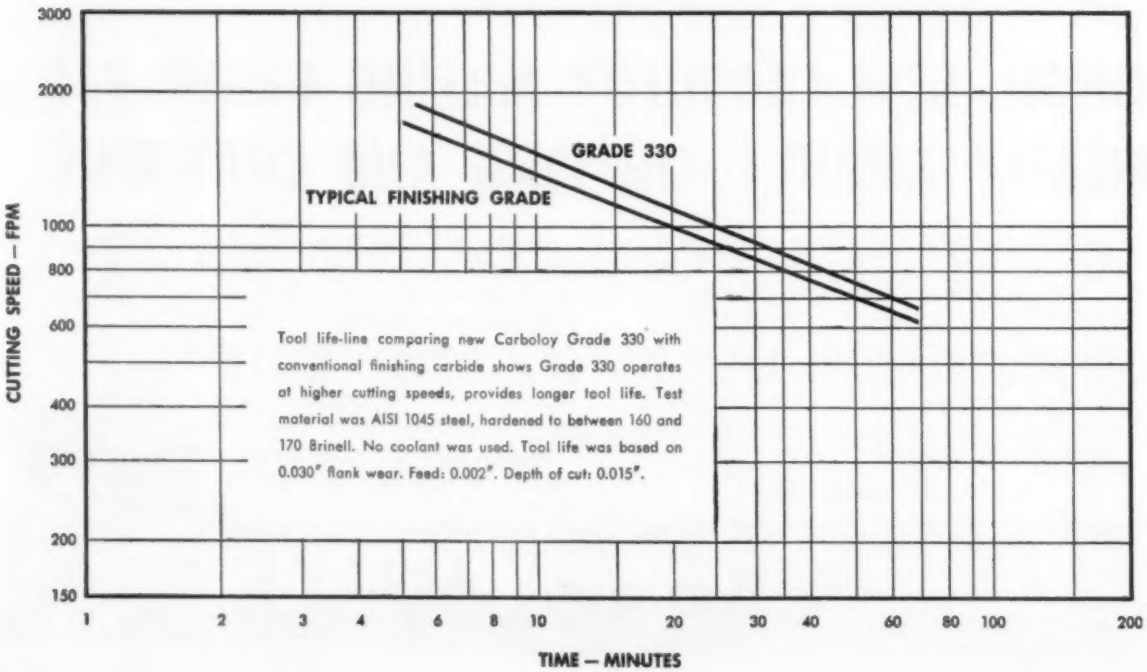
Conventional carbide (Figure 1) shows type of brazing crack that can greatly reduce tool life and increase machining costs.

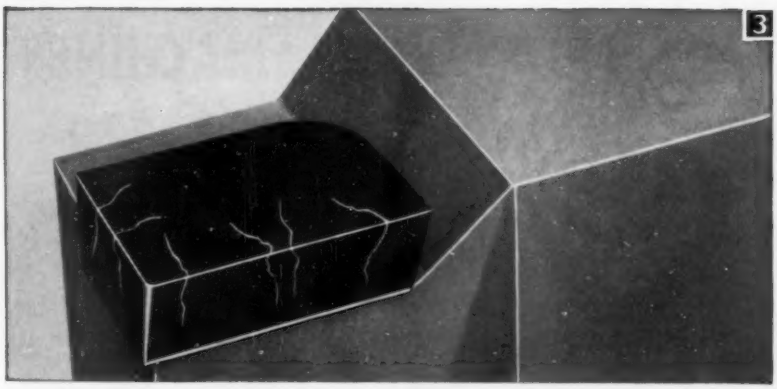
Carboloy Grade 330 (Figure 2) uses nickel binder to provide greater strength and toughness to resist brazing strains. For further protection, the wholly new composition of Grade 330 permits the use of high-silver solders with lower melting points. (Photos have been retouched to bring out brazing cracks difficult to see with the naked eye.)

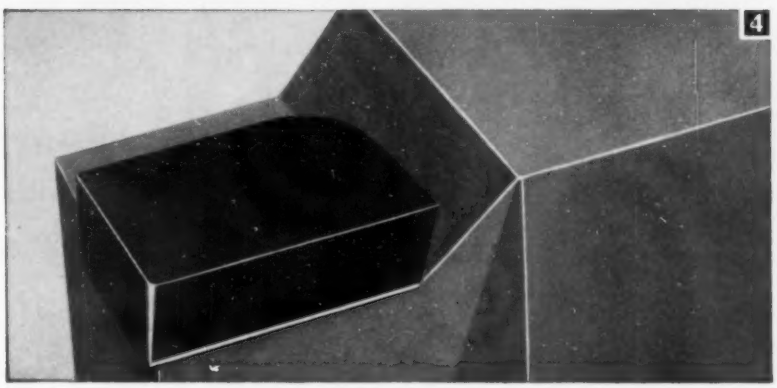



# NEW CARBOLOY STEEL-FINISHING GRADE 330






**GRINDING CRACKS ELIMINATED**

Ordinary steel-finishing carbides are so brittle that grinding cracks (Figure 3) frequently appear. Automatic grinders cannot normally be used.

Because Grade 330 (Figure 4) has twice the transverse rupture strength of ordinary carbides, it has superior resistance to grinding cracks, can be easily ground on duplicating-type grinders. (Photos have been retouched to bring out grinding cracks difficult to see with the naked eye.)

# MACHINES FASTER, WEARS 20-35% LONGER

- **Easier to braze and grind**
- **Double transverse rupture strength**
- **More resistant to chipping, cracking**

With a transverse rupture strength of 200,000 psi, new Carboloy Finishing Grade 330 is nearly twice as strong as conventional steel-finishing carbides.

Used on finishing and boring jobs, this extra strength means greater resistance to chipping and cracking, along with improved tool life.

**Entirely new composition**

The secret of Grade 330 is its higher titanium-carbide content and nickel binder. Grade 330 is tougher, easier to grind, and more wear resistant than cobalt-binder grades.

Production tests on AISI 1045 steel (see chart at left) show Grade 330 can be operated at speeds 10% higher than other carbides without any loss in tool life. When compared at speeds ranging from 600 to 1900 fpm, Grade 330 consistently provided 20-35% longer tool life than other grades.

**Extra-performance steel-cutting carbides**

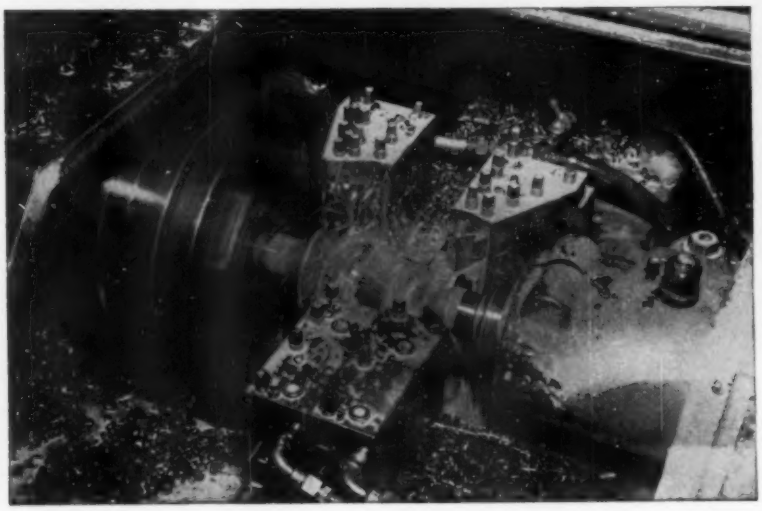
Grade 330 rounds out the Carboloy extra-performance Series 300 carbides (Grades 350, 370), taking up on finishing and boring where Grade 350 leaves off.

Throw-away inserts, standard blanks, square and solid boring tools are now available from Authorized Carboloy Distributors. For price list and specifications on Grade 330, send the coupon on page 4 of this advertisement.

**CARBOLOY**
DEPARTMENT OF GENERAL ELECTRIC COMPANY

# GET MORE OUTPUT FROM YOUR MACHINES WITH CARBOLOY GRADES 350 AND 370

▶ **Remove more steel per minute** ▶ **Reduce downtime and tool costs**





Edwards Valve Division, Rockwell Mfg. Co., found that interrupted cuts on 207 Bhn steel limited production to 25 pieces per edge with former carbide. After switch to Grade 370 inserts, production jumped to 40 . . . an increase of 60%.

**SETUP: Material** – 4140 forged steel. **Speed** – Over 400 fpm. **Feed** – 0.009". **Depth** of cut – ¼" to ½".

Carboloy Grades 350 and 370 are *extra-performance* carbides. They are specifically designed to take heavier, deeper cuts at faster speeds . . . to provide maximum machine output at lowest tool cost.

Hundreds of in-plant case histories like the one above have proved Grades 350 and 370 consistently outperform, outwear all other steel-cutting carbides.

**Greatly increase output**

Even on the toughest jobs, these carbides have brought production increases ranging from 30% to 300% . . . reducing the cost per finished piece.

Carboloy Grades 350 and 370 have a built-in structural rigidity that resists edge deformation even at temperatures as high as 1800° F. Their ability to stay on the job longer means less downtime, more production from the machine.

**Complete stocks available locally**

Try medium-duty Grade 350 and heavy-duty Grade 370 on your steel-cutting jobs . . . and lower your tooling costs.

Your local Authorized Carboloy Distributor maintains complete stocks of both these grades in a wide range of tools, blanks, and inserts. His name is listed in the Yellow Pages of the phone book. For more information, call him today or mail the coupon below.

**CARBOLOY**

DEPARTMENT OF GENERAL ELECTRIC COMPANY

**11101 E. 8 Mile Road, Detroit 32, Michigan**

Send me more information on:

- ☐ New Milling Grade 860
- ☐ New Finishing Grade 330
- ☐ Grades 350 and 370
- ☐ Send the name of the nearest Authorized Carboloy Distributor

Name_____

Title_____

Company_____

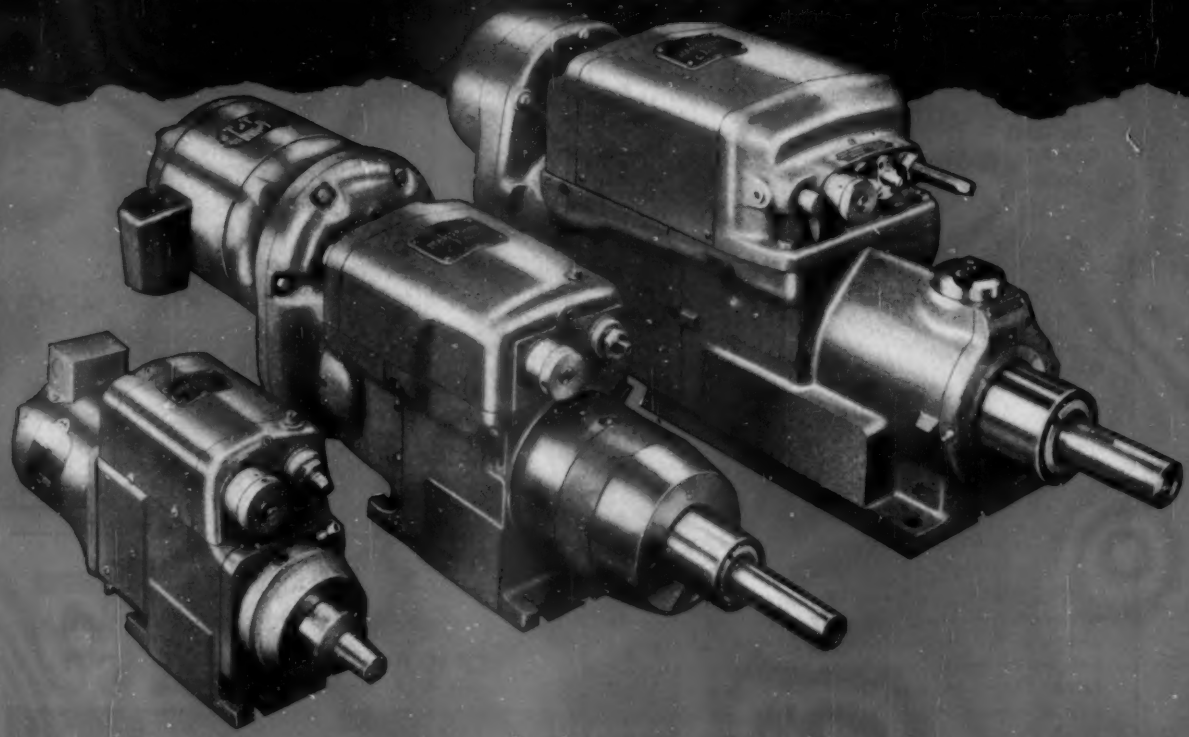
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City_____ Zone____ State_____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

HARTFORD *Special*

# *COMPLETE* DRILL UNIT LINE!



## CONDENSED SPECS . . . 3 Models, 15 Drive Arrangements

| Model No. | Drilling Capacity Mild Steel | Tapping Capacity Steel | Maximum Stroke | Horse Power | Spindle Speed Range | Feed Range | Rapid Approach Rate | Rapid Return Rate | Standard* Spindle Nose |
|---|---|---|---|---|---|---|---|---|---|
| 19-150 | 5/16" dia. | 3/8" | 1½" | ⅓ to ¾ | 300 rpm to 10,000 rpm | 0-70 ipm | 350 ipm | 300 ipm | #2 Jacobs external taper |
| 19-400 | 5/8" dia. | 5/8" | 4" | ¾ to 2 | 100 rpm to 5,000 rpm | 0-50 ipm | 300 ipm | 240 ipm | #2 Morse internal taper |
| 19-600 | 1¼" dia. | 1" | 6" | 1½ to 5 | 28 rpm to 3,450 rpm | 0-180 ipm | Adj. to 300 ipm | Adj. to 240 ipm | #4 Morse internal taper |

* Special spindles available on request.

If in your plant you drill, tap, ream, spot-face, center, hollow mill, chamfer or counter-sink and you want to cut costs, send for this catalog . . .



MACHINE TOOL DIVISION
THE HARTFORD SPECIAL MACHINERY CO.
2087 Homestead Avenue, Hartford 12, Conn.

☐ Have Field Engineer call.
☐ Send Application Data Sheet and descriptive Bulletin.

Name _____

Company _____

Street _____

City _____ Zone ____ State _____

# ACCURACY .0002 T.I.R.

.0002 T.I.R. OR LESS AT SPINDLE NOSE, .0005 T.I.R. OR LESS ON TEST ARBOR SIX INCHES FROM SPINDLE NOSE

SPINDLE SPEEDS 150 and 250 RPM Other Spindle Speed Pulleys Available



## MODEL B943 MOTOR DRIVEN WORK HEAD

No. 11 B & S Tapered Spindle Standard Equipment. No. 12 B & S or No. 5 Morse Available at Slight Extra Cost.

The B943 Motor Driven Work Head is a compact self-contained power unit for internal and external grinding. It is held in position by two T-slot bolts and can be mounted at any convenient spot on the table. The swivel base, which is graduated 90° one side of center and 45° on the other, permits the Work Head to swivel full 360° if desired. Swivel base can be easily removed from head permitting units to be mounted on table without base if desired. The B943 is easily and quickly mounted on other makes of grinders.

The No. 11 B & S tapered spindle, mounted on ball bearings, is hardened and ground, and is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. Unit is grease packed at factory and requires no service in the field for the life of the bearings. Streamlined in design, this fixture is quickly mounted and is easy for the operator to keep clean.

The special motor is provided with conveniently located reversing switch which is handy for the operator regardless of the position of the work table or rotation of the work. Motor operates quietly and is fully protected from dust and from any oil entering from working parts.

*See this extremely accurate B943 work head at your equipment dealer or write for complete literature.*

**K. O. LEE COMPANY**
ABERDEEN, SOUTH DAKOTA

USE READER SERVICE CARD; INDICATE A-6-216-1

Always MAKES SET-UP JOBS EASIER



Types to fit any machine used for tapping or reaming.

Ask anyone who has ever used a Ziegler Tool Holder in making set-ups for tapping and reaming and he will tell you that it takes much less time and effort than with a tool holder that does not have the special Ziegler features.

With ordinary tool holders it is a time-consuming job to align the work accurately with the spindle. But with the Ziegler all that is necessary is to align it to within 1/32" of perfect accuracy and the holder automatically does the rest.

Besides reducing set-up time, it also produces better work and makes tools last longer. Investigate! It may be the solution to your production problem.

PROMPT DELIVERY

**W. M. ZIEGLER TOOL COMPANY**
13574 AUBURN DETROIT 23, MICH.

Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

WRITE FOR CATALOG

USE READER SERVICE CARD; INDICATE A-6-216-2

# GEORGE L. DETTERBECK CO.

SINCE 1911

World's Largest Exclusive Manufacturer of SCREW MACHINE TOOLS!

CUTTING CAMS • HIGH SPEED STEEL AND CARBIDE FORM TOOLS • SPECIAL CUTTING TOOLS • SPLIT DRILL BUSHINGS • CROSS SLIDE KNURL HOLDERS • TOOL BITS • BOX TOOLS • BURNISHING TOOLS • REVOLVING STOPS • RECESS SWING TOOLS • FORMING SWING TOOLS •

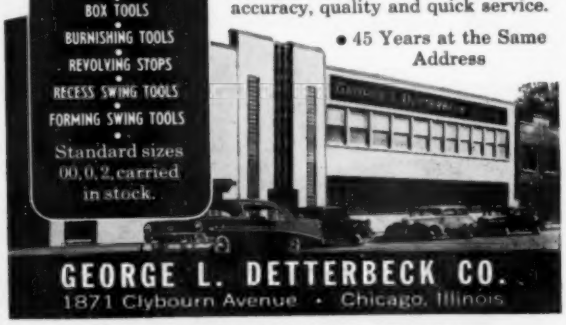
Standard sizes 00, 0, 2, carried in stock.

We specialize in one thing only... designing and making SCREW MACHINE TOOLS!

45 years experience goes into every tool we make. They come to you ready for use... Precision design... Skilled workmanship... Finest materials.

Our extensive facilities save you TIME... MONEY... and give you accuracy, quality and quick service.

• 45 Years at the Same Address



GEORGE L. DETTERBECK CO.
1871 Clybourn Avenue • Chicago, Illinois

USE READER SERVICE CARD; INDICATE A-6-216-3

# TAREX

## AUTOMATICS

. . . here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:

## FOUR ROBUST SLIDES!



The front and rear slides mounted on crossed ways, *permitting radial or lateral movements, or combined to produce tapers or irregular forms.* This allows the use of single point tools in many cases in place of form tools with their inherent side thrust. All tool slides actuated by camming systems having adjustable ratios. (The two upper slides are radial only). Machine throughout is engineered to take American-made tools!



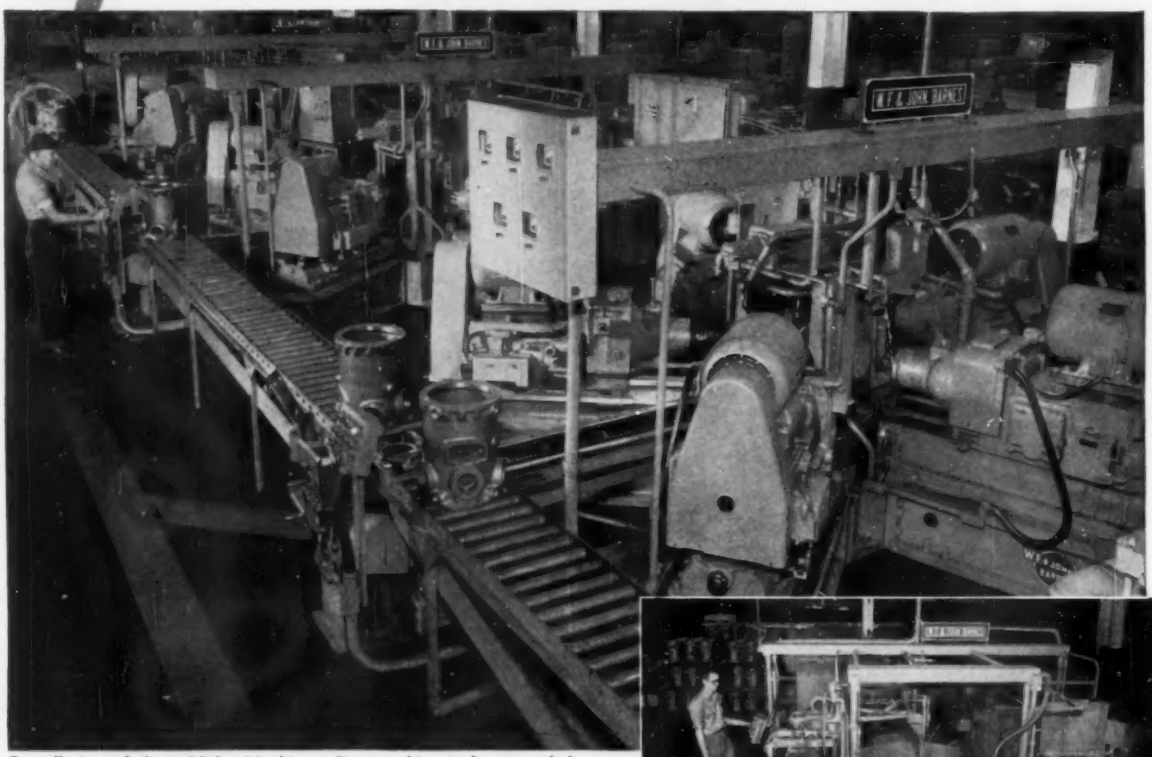
COMPLETE TOOLING and SERVICE in AMERICA.

## RUSSELL, HOLBROOK & HENDERSON, INC.

**292 Madison Avenue, New York 17, N. Y.**

# HOW W. F. & JOHN BARNES

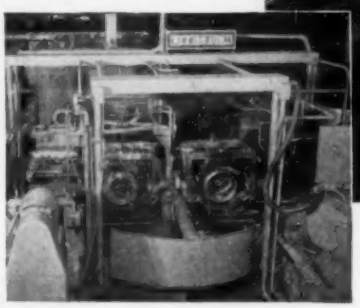
# "Specials" Cut Costs on



Overall view of three 5-Way Machines. First machine in foreground, bores and faces 5 flange holes; second, performs 8 combination drilling and chamfering operations; third, handles 14 tapping operations. All three machines are equipped with power transfer from gravity conveyor. One operator loads and unloads three machines at pushbutton stations.



View showing workpieces in center turntable after 180° turn, ready for traversing into new machining position. Machining cycle at station 2 allows operator time for unloading and loading at station 1 without losing production time.



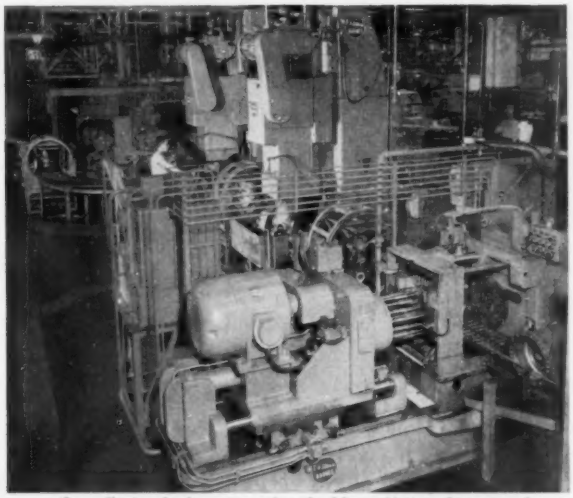
4-Way Machine with reciprocating index fixture. Left-hand two-spindle heads drill and finish-ream .750" dowel holes in both ends. Right-hand single stub-spindle heads bore, chamfer and face stator and cylinder ends.

W. F. & JOHN BARNES

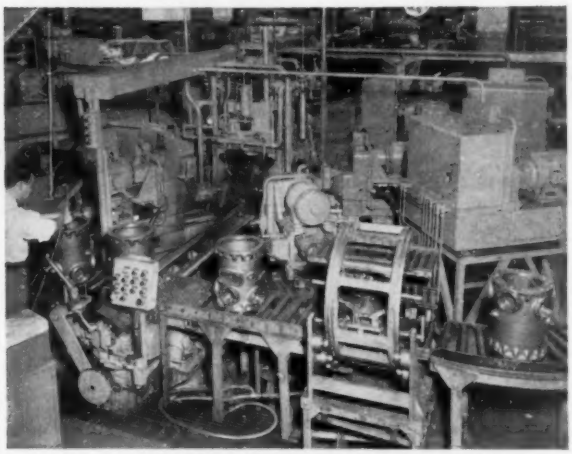
*BUILDERS OF BETTER MACHINES SINCE 1872*

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

# Low Production Work



Overall view looking toward end of line. Unit in foreground taps 31 holes in ends of piece and presses in two center bushings. Vertical machines are facing units for machining stator end and hub, and cylinder end and hub.



View of 6-Way Boring Machine for finishing five cylinder bores and two babbited bushings. Concentricity of stator and crankshaft bores is held to max. of .005" T.I.R. Babbit chips are collected in separate chip box. C.I. chips for entire line are flushed automatically to a central system.

## MULTI-STATION UNITS REDUCE MACHINING TIME ON COMPRESSOR CRANKCASES 1.85 HRS. PER PIECE

At Airtemp Division, Chrysler Corporation, Dayton, Ohio, a battery of ten Barnes Multiple Spindle Machines are today demonstrating the efficiency and economy of special machines engineered to serve relatively low production requirements. Previously, the compressor crankcases used in Airtemp's fine line of large 5-cylinder commercial air conditioning units were drilled, milled, bored, faced, and tapped in single operation machines. Now, most of these operations are performed automatically in Barnes specials. As a result, machining and handling time has been reduced 1.85 Hrs. per case. In addition, close tolerances are more easily maintained which has increased product quality.

## PRODUCTION GEARED TO 15 CRANKCASES PER HOUR

The Barnes Multiple-Spindle Specials are incorporated into a semi-automatic production line which is geared to produce 15 crankcases per hour. Parts are moved between machines on gravity conveyors, and operators manually position workpieces into the loading station of each machine. Powered turnover and transfer devices are included to minimize manual effort. After more than 12 months of operation, the new line has effected savings equalling the preliminary estimates of Airtemp Engineers, and at the same time has provided the additional capacity to meet an increased demand for their product with little increase in floor space.

## INVESTIGATE BARNES SIX-POINT COORDINATED MACHINE BUILDING SERVICE

We suggest you investigate the profit possibility of applying Barnes special machines to your work. Find out, too, how Barnes six-point coordinated engineering and building services can help you eliminate divided responsibility and save time. Write for free brochure or ask for an analysis on any specific job.



**W. F. & JOHN BARNES COMPANY**

405 SOUTH WATER STREET · ROCKFORD, ILLINOIS

# 19 KNEE-TYPE MILLS CONTINUALLY TESTING
# INGERSOLL INSERTED BLADE CUTTERS



Actual performance is the only true test of cutting tools. Here in our own plant, Ingersoll cutters are used on 19 knee-type milling machines of various makes and are regularly meeting exacting standards for finish, high feeds and long tool life.

We know from our own experience that Ingersoll cutting tools can meet your strict requirements for machining a wide variety of parts and materials on all types of milling machines.

It will pay you to let one of our cutter engineers demonstrate the performance and economy of Ingersoll inserted blade milling and boring cutters.




**Write Today for new Ingersoll Cutter Catalog 66F, describing Ingersoll inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters and boring heads.**

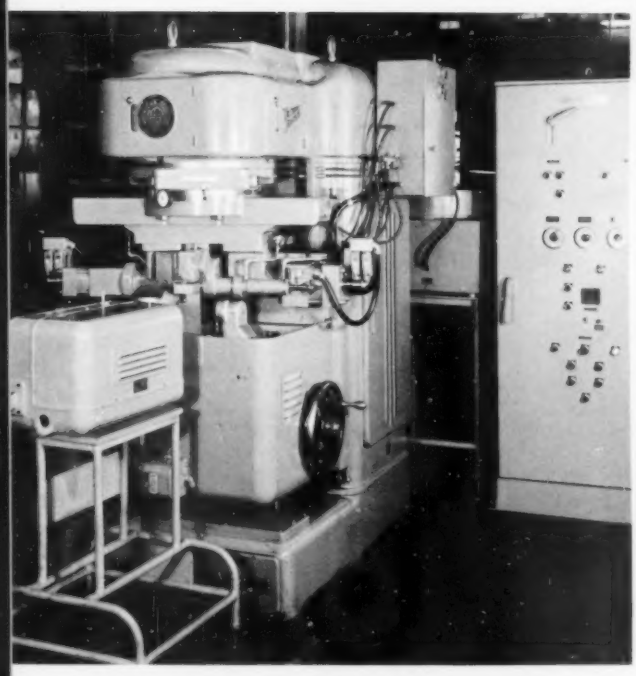
THE **INGERSOLL**
MILLING MACHINE COMPANY
ROCKFORD, ILLINOIS, U. S. A.

*BUILDERS OF SPECIAL DESIGN MILLING & BORING MACHINES*
*ORIGINATORS OF SHEAR CLEAR CUTTERS*

*This Month's*

# GEAR PIX





**LATEST GEAR-O-MATION®** equipped Michigan 870 gear shaver finishes 18-tooth automotive pinions at 260 per hour. Features are: hopper feed, automatic load and unload, pneumatic headstock and tailstock, 3-way classifier with automatic feedback maintaining correct center distance, desired accuracy and production requirements preset on control panel, more accurate gears produced.



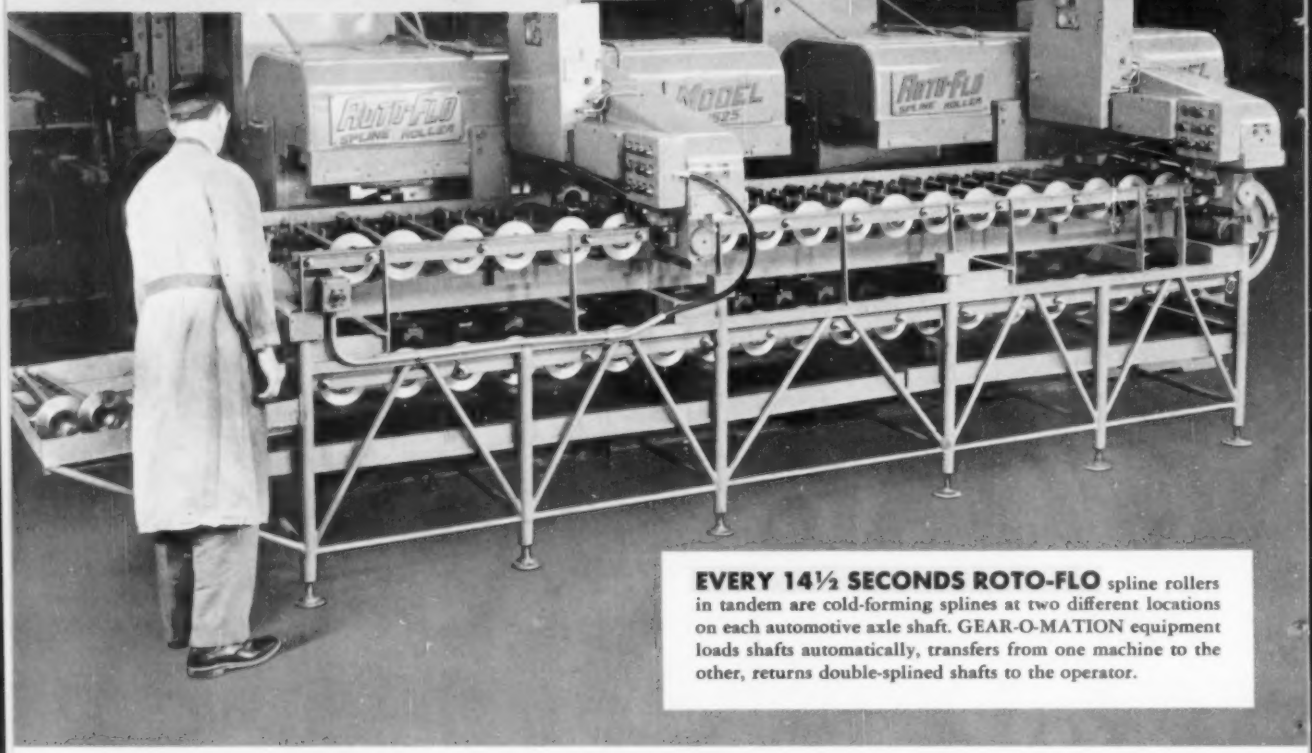

**MACHINE TOOL BUILDER** shaves a wide variety of gears (a few are shown) on this Michigan 870-A gear finisher. Underpass is used for shoulder cluster gears, while the transverse method, in combination with crowning, is favored for shaving wide face spur and helical gears. This 870-A has an 18-inch capacity, which covers practically all requirements for this Illinois firm.

**MICHIGAN TOOL COMPANY**

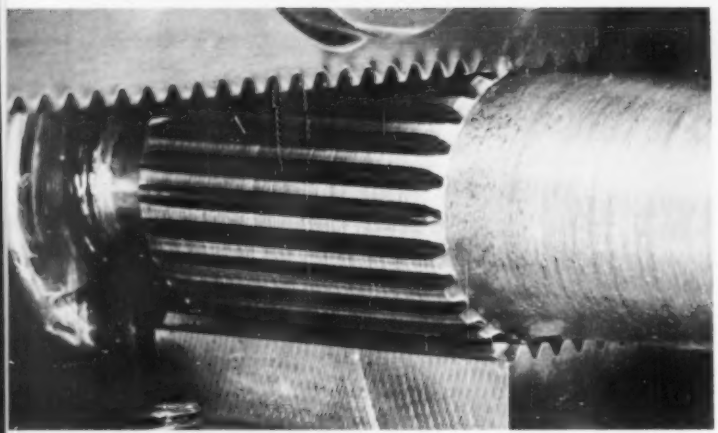
7171 E. McNICHOLS RD. • DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

*This Month's*

# GEAR PIX




**EVERY 14½ SECONDS ROTO-FLO** spline rollers in tandem are cold-forming splines at two different locations on each automotive axle shaft. GEAR-O-MATION equipment loads shafts automatically, transfers from one machine to the other, returns double-splined shafts to the operator.



**ROTO-FLO FORMED SPLINES,** just coming off the forming racks. Actual forming process takes 4 or 5 seconds—floor to floor time is 10 to 15 seconds. Cumulative spacing error is less than .0015 inch—compare it to your present spline manufacturing.



**COLD-FORMED HELICAL TEETH** (by ROTO-FLO process), as shown here, have a very high degree of accuracy. Note the sharp, square corners at the top of the teeth, the 3 to 6 micro-inch finish on the tooth form. Compare the few seconds required to produce parts like these with your present production on similar parts.

**MICHIGAN TOOL COMPANY**

7171 E. McNICHOLS RD. • DETROIT 12, MICH.

*IN CANADA: COLONIAL TOOL CO., LTD.*

# Chances are at least **98 out of 100** that this part will be **perfect**



**The Metal Stampings Plant, Sylvania Electric Products, Inc., keeps rejects under 2%—even on complex, close-tolerance parts produced at rates to 9,000 per hour. Optical gaging helps set this level.**

The diode plate shown above is an example of the complex, mass-produced, parts turned out to close tolerances by The Metal Stampings Plant, Sylvania Electric Products, Inc., at York, Pennsylvania. Tolerances run to ± .001"; as many as 10 dimensions must be held, including inner and outer diameters. Yet even on parts more difficult than this—parts with tolerances of .0005" and forming rates of 9,000 per hour—Sylvania gets an acceptance rate of over 98%.

Inspection on Kodak Contour Projectors helps Sylvania do the job to the satisfaction of its customers, both internal and external. Operators check the first parts produced by every machine to assure correct setup. Then, throughout the run, production samples are checked at regular intervals—making certain each machine is holding to tolerance. The speed with which these parts can be checked using optical gaging methods has helped slash rejection rates more than 50% since Kodak Contour Projectors were installed.

If you have difficult inspection problems involving quantity, speed, close tolerances or hard-to-measure dimensions like shoulders, holes, radii or angles, there's every reason to expect a solution by optical gaging on a Kodak Contour Projector. There's a representative in your area who can tell you more. To get in touch with him, or for a copy of the booklet, "Projection Gaging with Kodak Contour Projectors," write Special Products Sales Division.



**Little training is required to operate a Kodak Contour Projector. Operators sit comfortably in a fully lighted room. The work gets out in a hurry.**

**EASTMAN KODAK COMPANY,** Rochester 4, N. Y.

## the KODAK CONTOUR PROJECTOR

Kodak

# Tough grinding jobs?

## Check *Vulcanaire* high speed precision grinding heads!



Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.



Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.



Horizontal application. Grinding a shoulder Punch.

*Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.*

**Major Vulcan Services**

Engineering, Processing, Designing and Building... Special Tools... Dies ... Special Machines ... Vulcamatic Transfer Machines ... Automation ... including the Vulcan Hydraulics that Form, Pierce, Assemble and size. ... Vulcanaire Jig Grinders ... Motorized Rotary Tables ... Plastic Tooling.

**VULCAN TOOL CO.**

7300 LORAIN AVENUE • DAYTON 10, OHIO

USE READER SERVICE CARD; INDICATE A-6-224-1

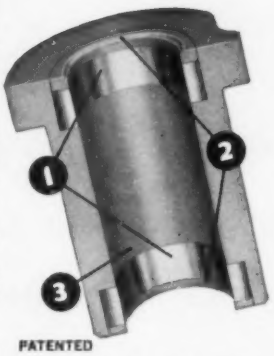


# MEYCO CARBIDE INSERTED DRILL JIG BUSHINGS PROVE THEMSELVES *IN Automation!*

The reason is simple: these unique bushings are ideally suited for long-running, uninterrupted operations!

MEYCO carbide inserted bushings assure long life for drills, jigs, fixtures ... accurate work maintained, resulting in less down-time, fewer lost man-hours. Last almost as long as solid carbide bushings, cost slightly more than ordinary bushings. Get the full story:

Write for information and price list, ask for Catalog No. 42




PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

EST. 1888



W. F. MEYERS CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-6-224-2



Over 85% of the torque wrenches used in industry are

# STURTEVANT TORQUE WRENCHES

*Read by Sight, Sound or Feel*

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

*in inch grams*
*...inch ounces*
*...inch pounds*
*...foot pounds*

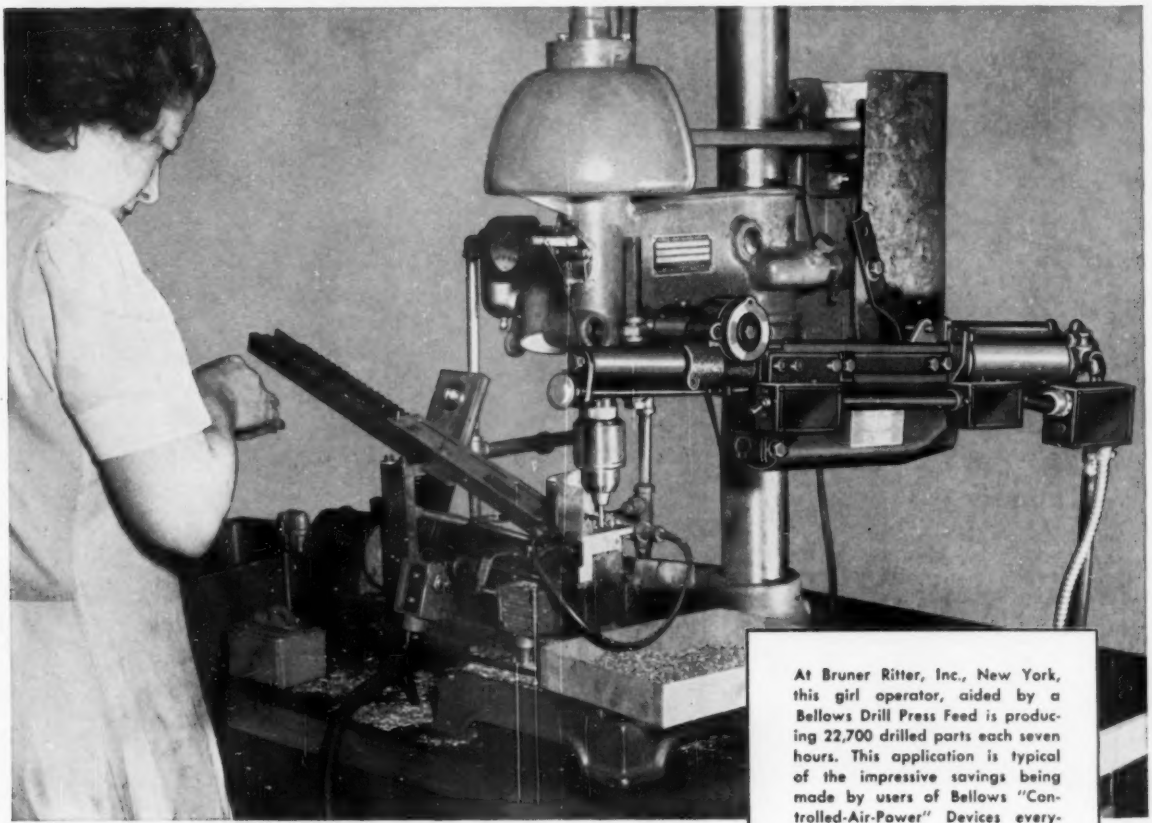



*Every manufacturer, design and production man should have this valuable data. Sent upon request.*

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

USE READER SERVICE CARD; INDICATE A-6-224-3

# "FLUID POWER"



At Bruner Ritter, Inc., New York, this girl operator, aided by a Bellows Drill Press Feed is producing 22,700 drilled parts each seven hours. This application is typical of the impressive savings being made by users of Bellows "Controlled-Air-Power" Devices everywhere.

## . . . has a place in every plant concerned with lower-cost production

The value of a minute is no more "fixed" than the value of a dollar. What it's worth depends on what you can do with it.

For example, a drill press operator positioning a part by hand, feeding the drill by hand, may produce X number of parts per hour. With Bellows "fluid power" on the job, she can produce between 2 X and 4 X parts per hour — and with a fraction of the physical effort.

Drill press operations are only typical. Wherever you have a repetitive operation of any kind done by hand, one or more Bellows "fluid power" units can do it faster, better, and with less fatigue to the operator.

These ingenious devices, powered by air, actuated electrically, controlled hydraulically, are complete "packaged" work units. They are designed to be incorporated into existing operations or standard machines easily and quickly. They lend themselves readily to custom machine design, making construction of special purpose machines relatively simple and inexpensive.




**Get more out of this minute!**

Write today for the new four-color booklet — "Lower Cost Production." And Bulletin DF-110R on Bellows Drill Press Feeds. They will be sent to you without cost or obligation. Address Dept. TE-756. The Bellows Co., Akron 9, Ohio. In Canada: Bellows Pneumatic Devices of Canada, Ltd., Toronto, Ont.

**The Bellows Co.**

AKRON 9, OHIO

1426A

# *News from Hamilton!*

## 100 to 300 ton press line sets new standards




Here's Hamilton's brand new high-speed 250-ton, double-crank press with 60" x 36" bed and slide

For the first time in the industry, Hamilton gives you 100 to 300 ton presses built to meet exacting automotive production standards . . . standards pioneered in the automotive field through more than thirty years of Hamilton press leadership.

Every one of these 2-point, single acting, straight-side, double-crank presses is a brand new design. Each is engineered for constant top-speed, top-quality production—without profit-robbing downtime. Each is built for complete operating flexibility. Here are just a few of Hamilton's built-in extras that mean more operating profit for *you:*

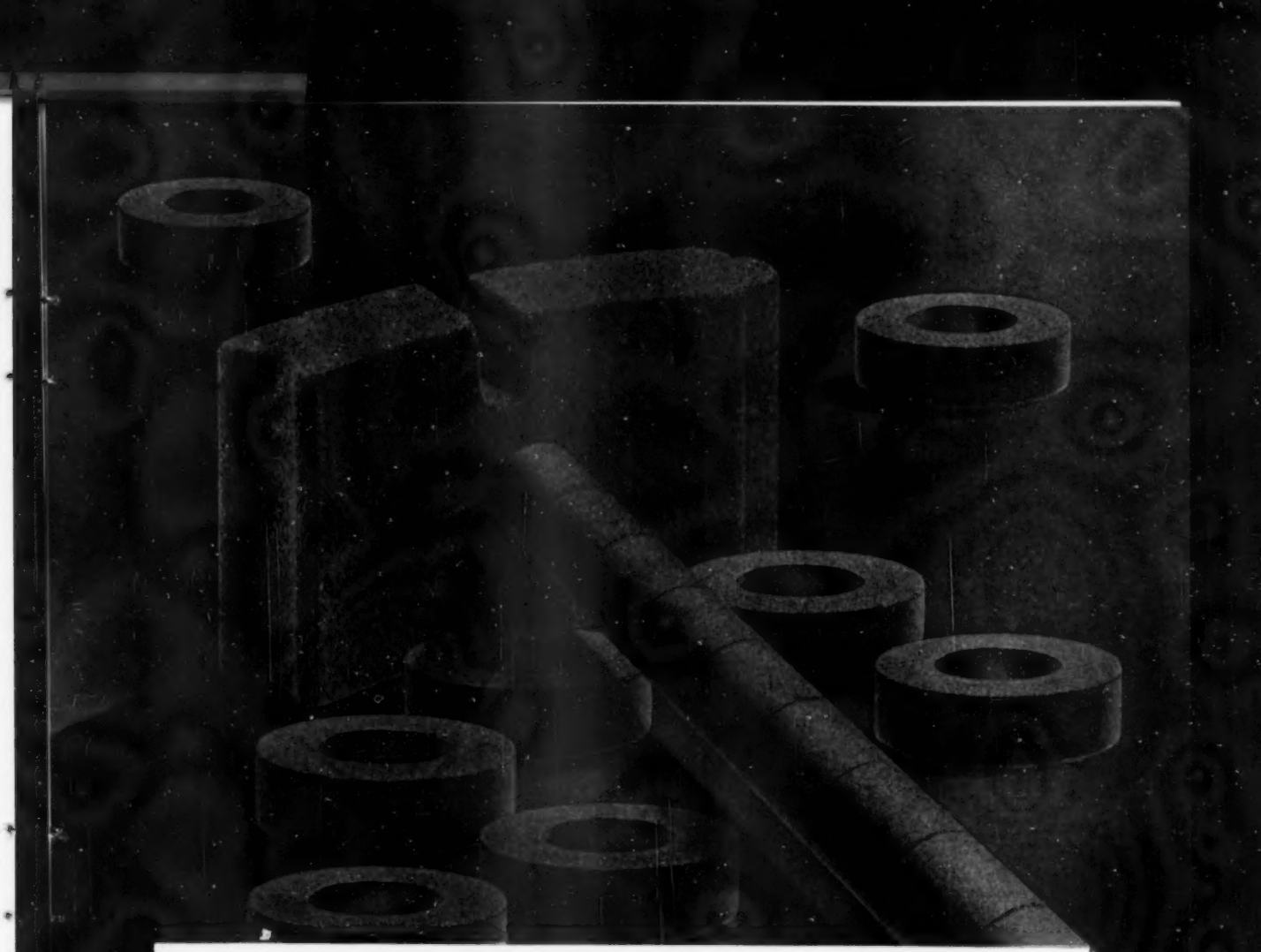
- rugged welded steel construction
- mechanically interlocked air clutch and brake
- barrel-type motorized slide adjustment
- automatic lubrication
- pneumatic flywheel brake
- die lights
- die cushions
- pneumatic counterbalances
- interlocked electrical clutch control

Exact specifications are adjustable to your individual requirements. Special electrical controls are available to meet particular electrical standards.

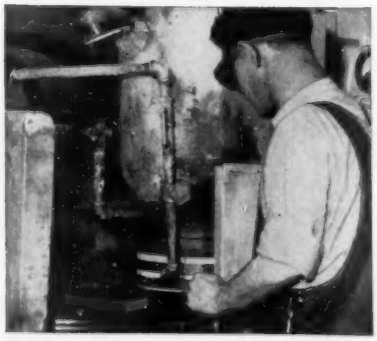
It will mean money in your pocket to find out today how these all-new Hamilton presses can help you turn out high quality stampings fast . . . without costly production downtime. Get the full story on these new standards for 100 to 300 ton presses . . . from Hamilton Division, BLH Corporation, Hamilton, Ohio.

BALDWIN · BLH · LIMA-HAMILTON

**HAMILTON DIVISION**
**BALDWIN-LIMA-HAMILTON**
DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works



# Rake in big savings by letting us engineer your grinding jobs



Tremendous new research and engineering facilities now allow Peninsular to make you this offer: Let our Abrasive Engineers make a thorough examination of your grinding operation. Based on our experience, we can practically guarantee to help you rake in savings.

At left is an example. On a typical surface grinding application like this, previous rate of production was 70 units per wheel, with grinding wheel life of 20 hours. After Peninsular wheel was installed, production rate rose to 250 units per wheel, and wheel life to 60 hours. Performance was improved over prior standards by 257%!

Call, write, or wire us today!

***Vitrified and Resinoid Grinding Wheels***

# PENINSULAR

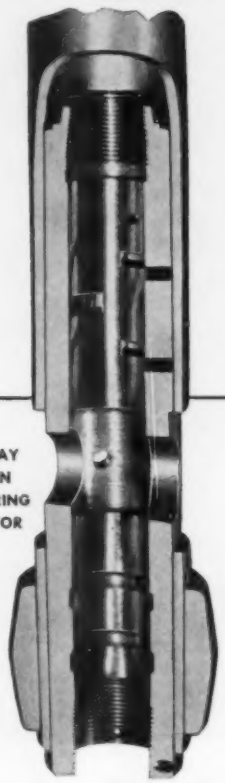
## GRINDING WHEELS

PENINSULAR GRINDING WHEEL DIVISION—ABRASIVE AND METAL PRODUCTS COMPANY—DETROIT, MICHIGAN

# MICROHONING*

## with self-dressing abrasives generates consistent *Functional Surface Finishes*

Microhoning, the low-velocity abrading process consistently produces part after part exactly to your specified surface finish requirements, because the abrasive grits always remain sharp.



CUTAWAY SECTION OF STEERING ACTUATOR

Monroe Auto Equipment Co. designed its power steering unit to withstand rugged use while maintaining sensitive control. In the final processing of the hydraulic steering actuator, Monroe chose Microhoning to obtain diametric accuracy, consistent finish and to generate geometric precision.

The rough and finish Microhoning operations removed .005" stock from an interrupted bore 1.125" in diameter and 6⅜" long.

*MATERIAL AND HARDNESS:* SAE 1118 steel, Rockwell 45-50C

*TOLERANCES:* size—.0003"
roundness and taper—.0001"

*FINISH:* 25 microinches or less

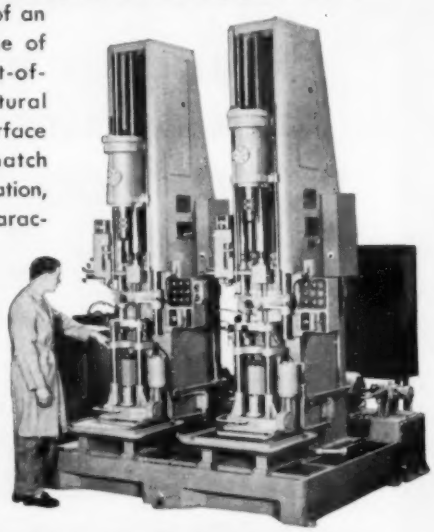
*CYCLE:* rough Microhoning—35 to 40 seconds
finish Microhoning—15 to 20 seconds

*MACHINE:* Double-column Model 740 Hydrohoner

**SELF DRESSING ACTION OF THE ABRASIVES** . . . is accomplished by the rotation and reciprocation of the Microhoning tool—the combined motion continuously changes the direction of force on the abrasive grits and keeps them dressed.

**EFFICIENT STOCK REMOVAL** . . . results from the many sharp-cutting grits acting simultaneously over a wide area of work surface. In this manner, the effect of heat is also minimized. Of all production processes, Microhoning least disturbs the sub-surface structure of the work.

**FUNCTIONAL SURFACE CHARACTERISTICS** . . . are obtained in one uninterrupted cycle. Microhoning generates accuracy within millionths of an inch . . . surfaces free of waviness, taper, out-of-roundness and structural stresses . . . uniform surface finish and a cross-hatch pattern for best lubrication, sealing and wear characteristics.



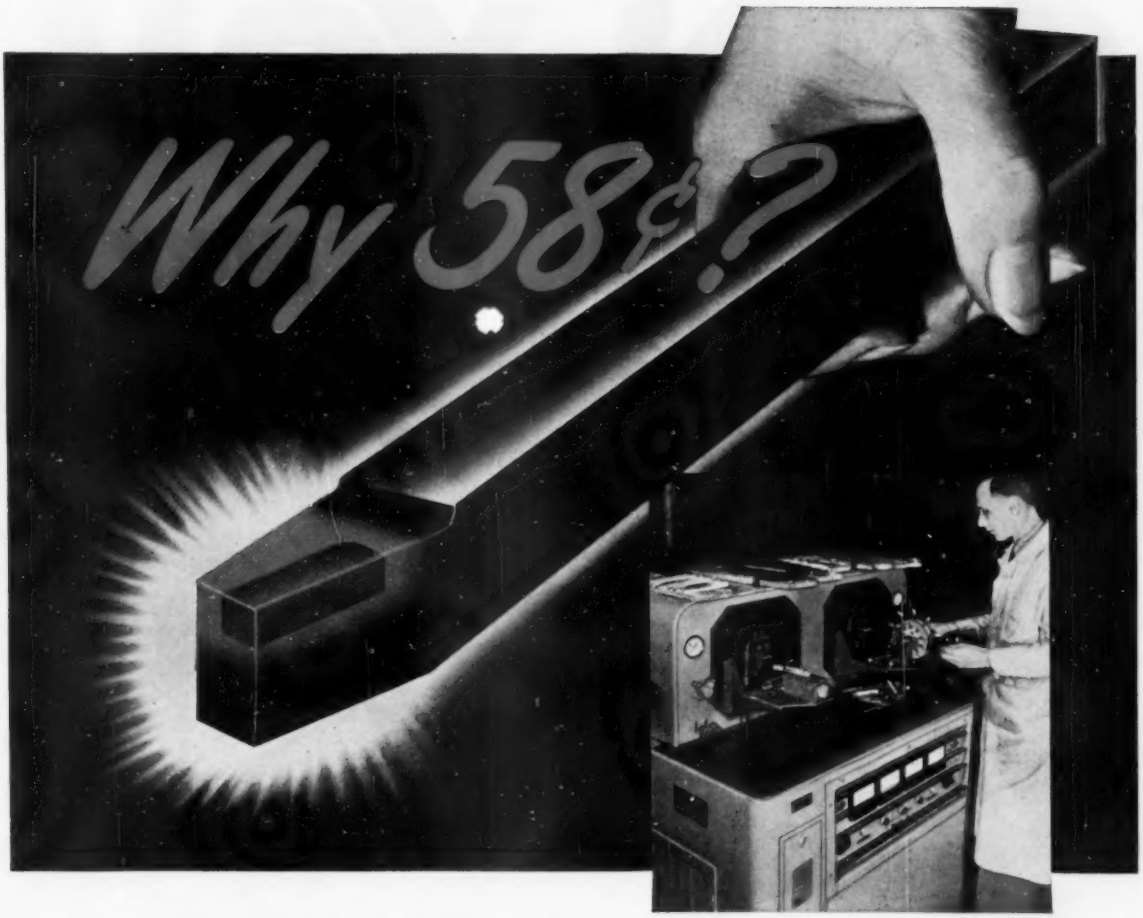
PRECISION PRODUCTION THROUGH MICROHONING
MICRO MATIC

*For more details on this application write for CROSS-HATCH Vol. 8, No. 1*

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

## MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN




# Braze it for 4¢ with TOCCO*

Willey's Carbide Tool Company, Detroit, reports the following benefits from TOCCO *Induction Brazing* of tool tips:

1. ***Large lathe tools:*** **8 times as fast.** ***TOCCO brazes 85 per hour; former method 80 per day.***
2. **Cost cut from 58¢ to 4¢** ***for each large tool.***
3. ***Small tools (¾" to ¼" square):*** **TOCCO brazes 250 to 400 per hour.**
4. ***Two 15-KW TOCCO machines*** **paid for themselves in three months.**

Mail coupon for information on many other brazing applications where TOCCO saves important time and money.

**THE OHIO CRANKSHAFT COMPANY**




**TOCCO**

*Mail Coupon Today*

NEW FREE BULLETIN

THE OHIO CRANKSHAFT CO.
Dept. G-7, Cleveland 5, Ohio

Please send copy of "Tool Tipping with TOCCO."

Name_____

Position_____

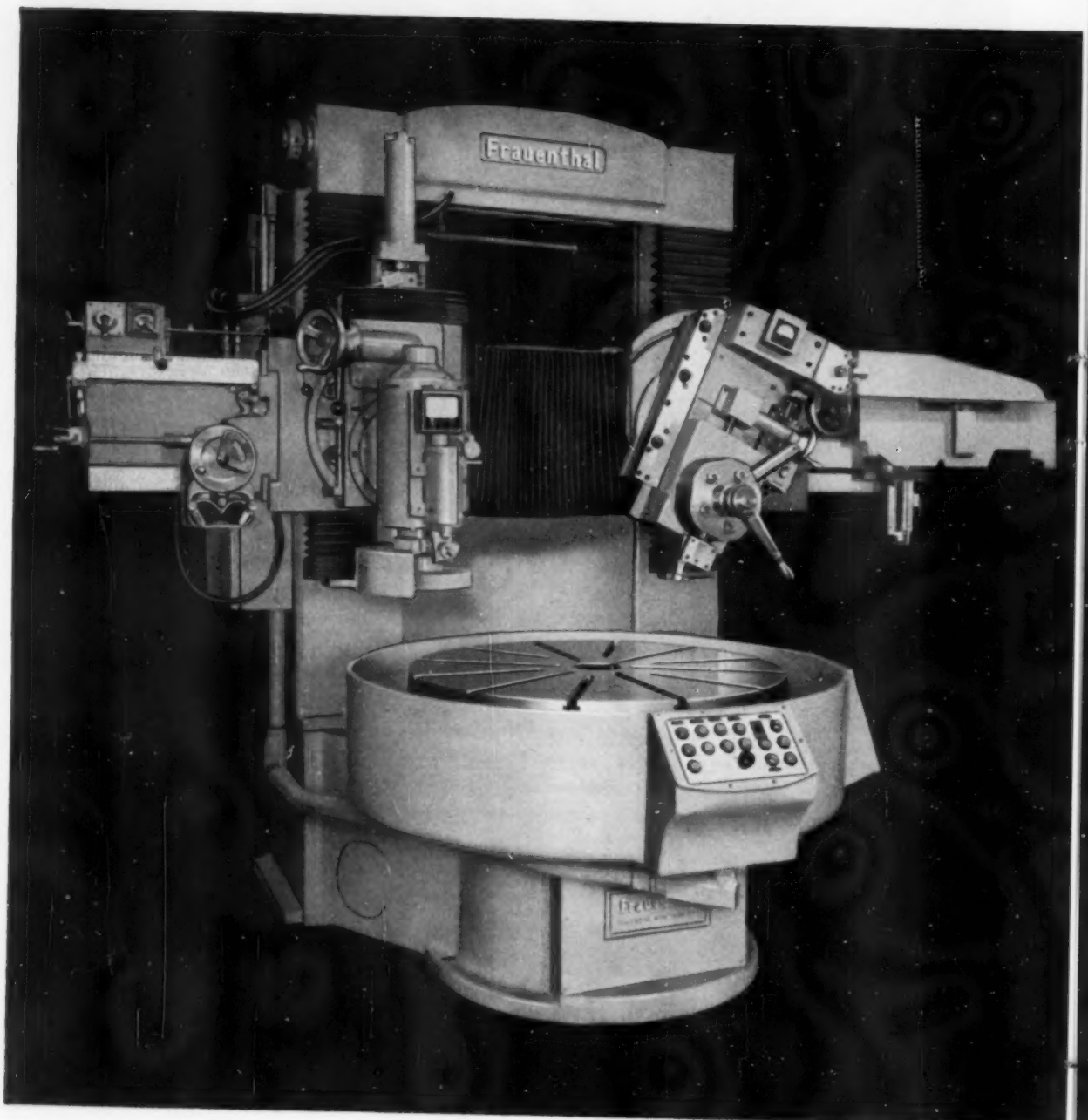
Company_____

Address_____

City_____ Zone____ State____

# CAN YOU

## to. 000200" accuracy



# turn, bore and grind in a single set-up?

## The Frauenthal 3100 Series offers this precision and versatility with these cost-cutting features

***1. Utmost versatility*** — Both grinding compound and turret slide can be swiveled to meet practically any angular requirement.

***2. Super-precision performance*** — Only a Frauenthal grinds related surfaces to accuracies within .000200", producing consistently uniform precision in concentricity, parallelism and roundness.

***3. Horizontal table*** — Loads easier and faster than vertical face plates. Horizontal table also provides greater stability for large, heavy parts.

***4. Simplified tooling*** — Horizontal table permits simpler fixtures, particularly for thin-section jet engine parts, plus economy of dual purpose tooling for turning and grinding.

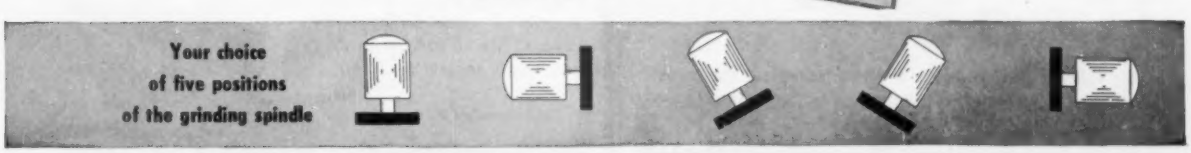
***5. Convenient controls*** — All operating controls are easily within the operator's reach for quick selection of feeds and speeds. Electrical interlocks are provided for utmost safety.

***6. Contour turning*** — Hydraulic duplicator attachment (turning head) performs tracer controlled turning operations most accurately and performs repetitive operations at lower cost.

***May we help you?***

If you'd like further information on how the 3100 Series precision turning and grinding machine can give you production and/or tool room advantages — our engineers are at your service. Write for informative bulletin No. 301.




**Frauenthal Division · KAYDON ENGINEERING CORP. · Muskegon, Michigan**

# FLIP THE SWITCH and Automatic Sawing Is Yours!




Model M-16 for cutting non-ferrous metals. One of three models available.

## Stone's New FULLY AUTOMATIC Bar-Feed Cut-Off Machine

**For Fast, Low-Cost Production Line Work**

| | |
|---|---|
| **ELECTRO-PNEUMATIC BAR FEED** | Automatically grasps single bar aluminum, brass, copper, magnesium or other non-ferrous metal, moving it exact distance required for cutting. |
| **AUTOMATIC POWER STROKE CUTTING HEAD** | Up to 1600 cuts per hour with a milled finish that eliminates need for further machining. Tolerances are held to .005" or less. Many runs have already produced tolerances of .001" for 90% of production. Cutting head is engineered with geared-in-head drive (a Stone exclusive) —delivering maximum power at lowest cost. Cuts any desired length, ¼" to 6 feet, with larger capacities on request. Capacity, 3½" solids, 5" OD tubing and extrusions. |
| **OIL MIST SPRAY LUBRICATION** | Saw blade is automatically lubricated with fine oil mist spray to give faster, cleaner cuts. Blade lasts longer and you get more cuts between sharpenings. |

**A Stone Cut-Off Machine for *Every* Operation** Whether you're cutting ferrous or non-ferrous metals, in everything from bar to sheets and plate, there is a Stone cut-off machine to meet your exact specifications. Write or call Stone Machinery Co., Inc. for complete details. No cost . . . no obligation.

***"...represented in every major industry throughout the world"***

**STONE MACHINERY COMPANY, INC.**

**31 Fayette Street, Manlius, New York**

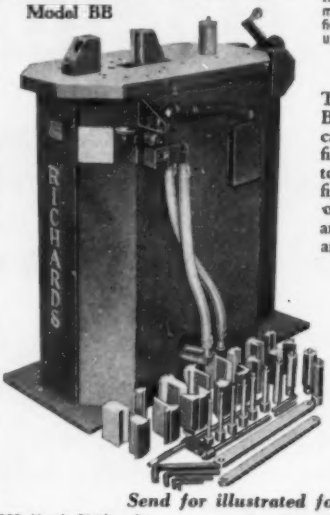
USE READER SERVICE CARD; INDICATE A-6-232-1

# Multiform

## BIG BROTHER BENDER

**Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses**

Model BB






Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender, using the standard tooling.

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra.

Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller hand or air operated models for forming up to ⅛"x1½" material.

These machines are solving new forming problems in many plants and could be the answer to yours.

*Send for illustrated folder TE-5*

903 North Pitcher St.
Kalamazoo, Michigan

**J. A. RICHARDS CO.**

USE READER SERVICE CARD; INDICATE A-6-232-2

# DYKEM STEEL BLUE

**Stops Losses** making Dies and Templates




Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

*Write for sample on company letterhead*

**THE DYKEM COMPANY**
2303D North 11th St. • St. Louis 6, Mo.

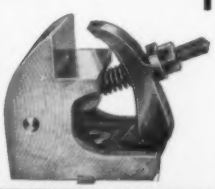
USE READER SERVICE CARD; INDICATE A-6-232-3

# HART MILLING FIXTURES

"Masters of A Thousand Set-ups"

**eliminate expensive jigs and fixtures**

Hold any shape stock aligned with miller, shaper, drill press or tapper. Famous for key-way setups. Value proven in large and small shops. 4 sizes



*Write for illustrated folder*

**WALTER W. FIELD & SON INC.**
39 HAYWARD STREET, CAMBRIDGE 42, MASS.

USE READER SERVICE CARD; INDICATE A-6-232-4

## A DIVERSIFIED LINE OF QUALITY!




# UNION

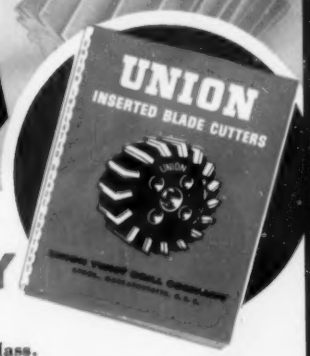
There's a Union Inserted Blade Cutter ready to do the job for you, quickly, accurately and economically. Union offers a complete selection of top quality Inserted Blade Cutters, standard and special, in two basic designs:

Wedge Type — Taper Serrated Blade Type — to suit the requirements of your job.

*Write on your company letterhead for our Inserted Blade Cutter Catalog. Address Dept. C-4.*



*Call your*
**Union Distributor**
*For Prompt, Dependable Service*




## UNION TWIST DRILL COMPANY

**ATHOL, MASSACHUSETTS**

*Owners and Operators of:* **S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.**
**BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec**



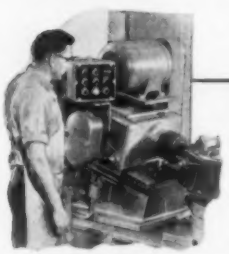
# How Two Types of Engineers Serve You With SUNDSTRAND "Engineered Production"

## DESIGN ENGINEERS

SUNDSTRAND design engineers devote their time to the design and development of basic standard units which can be used in many combinations of either standard or special machines. They are primarily concerned with the functioning of the individual components which go into a machine.

Their design experience is based on many years of development of units for light fast cutting on small parts, heavy cuts on large parts, three dimensional tracing of irregularly shaped work pieces and countless other problems in milling.

Some of the units developed are shown below. From these basic elements it's easy to get what you need from Sundstrand.



**TRAVELING HEADS**

Self contained units with ways for horizontal or angular travel.



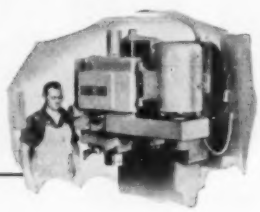
**HORIZONTAL TABLES**

Available in widths from 10½" to 96" and feed strokes from 18" to 216".



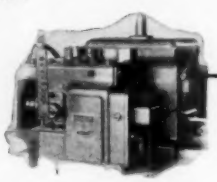
**INDEX BASES**

Easily applied to standard Rigidmils for increased production by the elimination of loading time or improvement in accuracy by the machining of multiple surfaces with one handling of the work piece.



**VERTICAL OR HORIZONTAL HEADS**

Available in capacities from 3 to 100 h.p.



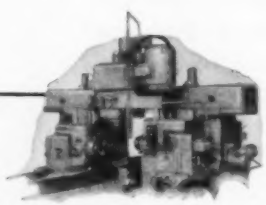
**ADJUSTABLE COLUMNS**

Movable columns provide maximum cutting rigidity for horizontal heads over a wider range for milling both large and small work pieces.



**VERTICAL FEED UNIT**

This unit provides vertical feed and rapid traverse in combination with the table movement for square cycles, clearing obstructions on work piece, etc.



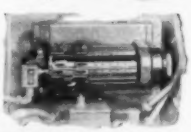
**RAIL TYPE HEAD**

Way type rail provides extreme accuracy over wide range of adjustment for vertical spindle head.



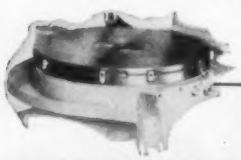
**TRACER MILLING UNIT**

Used for 3 dimensional tracer milling of intricate forms.



**AUTOMATIC QUILL POSITIONING**

Positions the cutter for multiple depths of cuts and provides automatic cutter relief.



**ROTARY TABLES**

Available in several sizes for continuous or rotary milling operations.

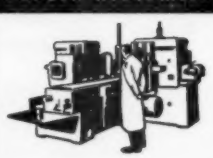
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

SUNDSTRAND "Engineered Production" Service*

*REG. U.S. PAT. OFF.









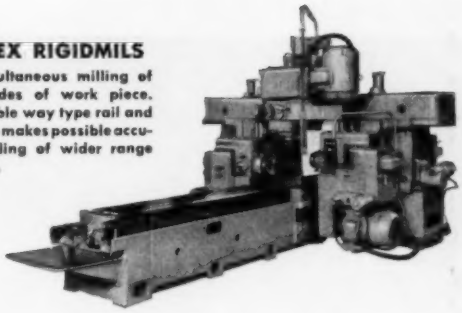
## APPLICATION ENGINEERS

In effect, our application engineers increase both the size and experience of your own processing department when you refer your milling problems to Sundstrand. They place at your disposal all the broad background of knowledge accumulated thru many years of finding the best method and then providing the most suitable unit or machine combination to do the job.

Shown below are just a few of the many machine combinations available from Sundstrand units. With this method of machine design and construction it is easy to obtain the proper equipment to suit your work.

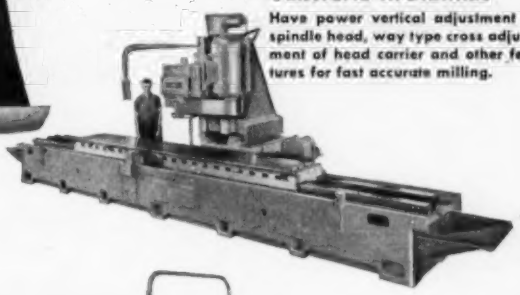
### TRIPLEX RIGIDMILS

**For simultaneous milling of three sides of work piece. Adjustable way type rail and columns makes possible accurate milling of wider range of work.**



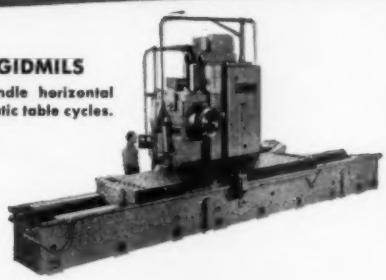
### VERTICAL RIGIDMILS

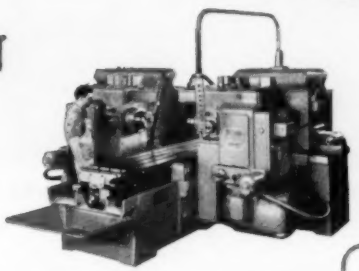
**Have power vertical adjustment to spindle head, way type cross adjustment of head carrier and other features for fast accurate milling.**



### SIMPLEX RIGIDMILS

**Have single spindle horizontal head and automatic table cycles.**



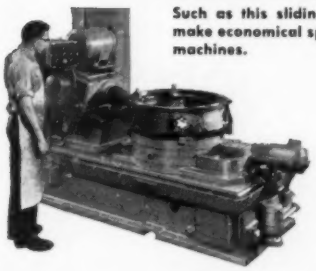


### DUPLEX RIGIDMILS

**Have two horizontal heads for milling two sides simultaneously. Adjustable column type shown has wider range between spindles.**

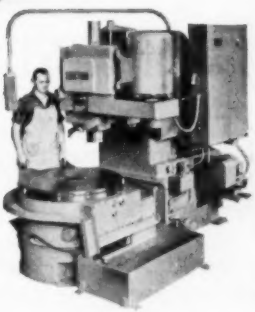
### UNIT TYPE RIGIDMILS

**Such as this sliding head machine make economical special production machines.**



### ROTARY RIGIDMILS

**Have vertical spindle head, way type cross adjustment of spindle head carrier and rotary table for continuous or circular milling.**

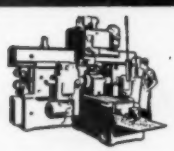


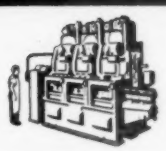
## FREE DATA

Get complete facts on the complete line of Sundstrand machine tools and "Engineered Production" service. Write for Bulletin 769.



TRIPLEX RIGIDMILS | SPECIAL MACHINES

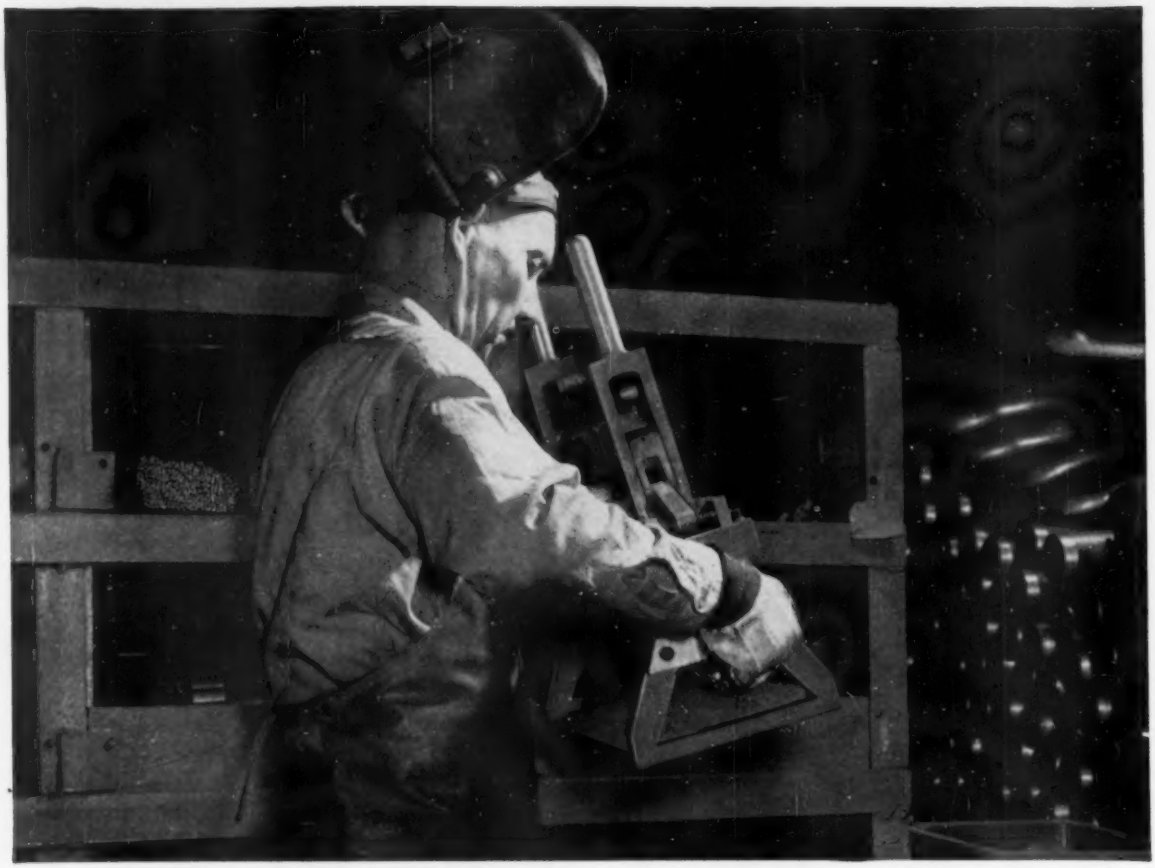




**SUNDSTRAND**
**Machine Tool Co.**
**2540 Eleventh St. • Rockford, Ill., U.S.A.**

*Made with MAGNESIUM*

DOW



**A FEW POUNDS make a big difference when jigs have to be moved manually several times an hour.**

# MAGNESIUM FOR LOW-COST TOOLING

## Lightweight magnesium tooling plate costs less to buy, less to fabricate and less to use

• **COSTS LESS TO BUY**—Jigs and fixtures made with magnesium cost you less in every way. Magnesium tooling plate costs less than commonly used lightweight tooling materials.

• **COSTS LESS TO FABRICATE**—Magnesium jigs and fixtures are easy and economical to build, too. The reason is that magnesium tooling plate is easy to machine, easy to weld. It has guaranteed flatness, excellent dimensional stability and freedom from porosity.

• **COSTS LESS TO USE**—Handling costs are also lower when you use magnesium tooling plate. Magnesium weighs one fourth as much as steel and only two thirds the weight of aluminum. By making your jigs and fixtures with lightweight magnesium you'll increase worker efficiency and reduce lost-time injuries.

For more information about magnesium tooling plate contact your nearest supplier of Dow magnesium, or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 371L.

**AVAILABLE FROM STOCK AT:** Copper and Brass Sales, Inc., Detroit, Mich. • Fullerton Steel and Wire Company, Chicago, Ill. • Hubbell Metals Inc., St. Louis, Mo. • A. R. Purdy Co., Inc., Lyndhurst, N. J. • Reliance Magnesium Company, Los Angeles, Calif. • Vinson Steel and Aluminum Co., Dallas, Texas.

*you can depend on DOW MAGNESIUM*

DOW

# GREENLEE OFFERS

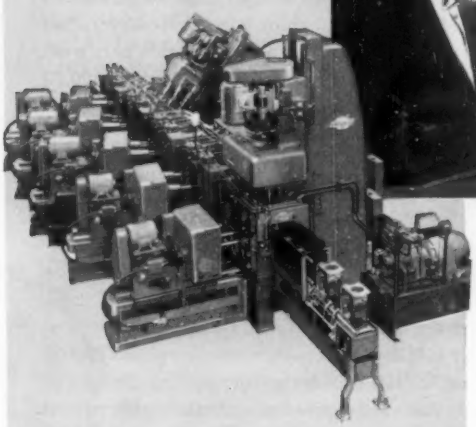
## A PROFIT-MAKING INVESTMENT IN HIGH-PRODUCTION MACHINE TOOLS



Greenlee Six-Spindle Automatic Bar Machine.



Greenlee 22-Station Automatic Transfer Machine for machining transmission cases.



Greenlee creative thinking, Greenlee engineering and Greenlee experience combined with that of your own engineers will help you "produce more at lower cost."

Ideas, engineering, experience and facilities of Greenlee Bros. & Co. develop improved methods and machines for greater and greater productivity of future models.

Greenlee's adequate facilities expedite the transition from production ideas to production machines . . . a profit-making investment at work in your plant.



Greenlee 10-Station Automatic Transfer Machine.

### GREENLEE STANDARD AND SPECIAL MACHINE TOOLS

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines

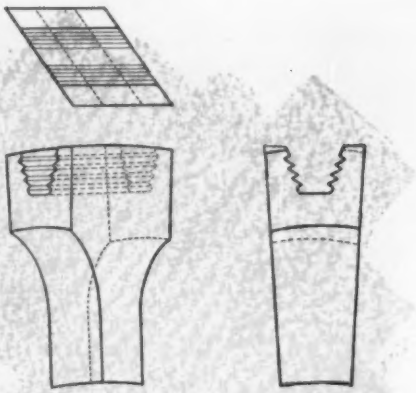
***Write for Further Information***

GREENLEE

**GREENLEE BROS. & CO.**
**1987 Mason Ave.**
**Rockford, Illinois**

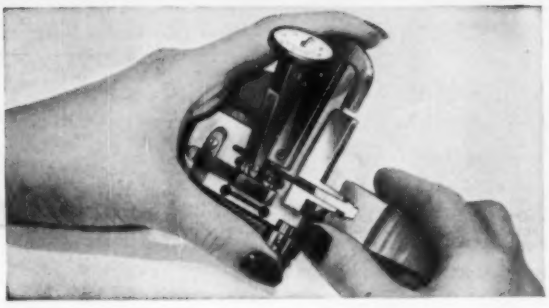
# WHICH GAGE WOULD YOU USE TO INSPECT THIS PART?





## An Air Gage?

An Air Gage *can* be used to gage the serrations in this insert for turbine blades. However, had the manufacturer set up to check this part with Air Gages, he would have invested $5,500.00 more than was required.



## A Dial Indicator Gage?

A dial Indicator Gage, specially modified for the work, proved the economical, right answer. **Thirty-nine** of these gages are used to assure that the dimensions of the "Christmas tree" form are held to exact size. Fast and simple, this gage fulfilled all requirements for accuracy and it cost far less because an inexpensive Dial Indicator was used instead of a much higher priced Air Gage.

**Most workpieces can be gaged in a number of ways.** A manufacturer of Air Gages exclusively will tell you that the gaging should be done by air and that **his** gage is the one you should buy. On the other hand, a manufacturer who makes only Dial Indicators will view the job in terms of Dial Indicators and will hope to sell you **his** gage to do the work. Usually there is **one** method which is clearly best for a given job and you cannot be sure of getting the best gage if you approach for recommendations a manufacturer who makes and sells only one kind of gage.

**Since Federal makes all modern gaging systems,** we can be impartial in our recommendations and supply you with whichever system best meets your needs.

Our specialized background of continuous and extended experience in gaging has taught us to analyze and solve gaging problems with certainty and to render sound service to our customers.

There is a Federal representative near you, ready to give you the facts impartially. He is unbiased and will recommend the **best** gage for your work. Write or call us today.

**Federal Products Corporation**
**6197 Eddy Street, Providence 1, R. I.**

**Federal's Solution to the Cost of Gaging:**
Impartial Gage Selection
Engineering Follow-Through
Everything in Gages

*Ask* **FEDERAL** *First*

**FOR RECOMMENDATIONS IN MODERN GAGES . . .**

**Dial Indicating, Air, Electric, or Electronic—for Inspecting, Measuring, Sorting, or Automation Gaging**



Partial view of a conventional round hole broach. Roughing, semi-finishing and finishing teeth are shown.



Surface broach with adjustable and replaceable carbide tipped tool bits.



Carbide tipped slab broaches.



This solid carbide finishing shell fits on an arbor of a conventional round broach.

# Here's Why Continental Quality Broaches Actually Cost Less Than Ordinary Broaches

Continental's experience in designing and manufacturing has broadened the use of broaching and has brought its advantages to applications that were normally considered impractical.

Continental engineers are tool specialists. Every tooth of a Continental broach is an effective cutting tool because of quality materials, skilled craftsmen and engineering experience.

Continental broaches are free cutting, hold required tolerances and finishes with maximum pieces per tool. That's why many manufacturers have learned to agree with Continental—*the best broaches cost less.*

**Continental**
**TOOL WORKS**
Division of
Ex-Cell-O Corporation
Detroit 32, Michigan

56-40




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LARGEST DELIVERABLE STOCKS ANYWHERE

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**ACE DRILL BUSHING CO., INC.**
5407 Fountain Ave., Los Angeles 29, Calif.



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# *Sets 'em twice as fast!*



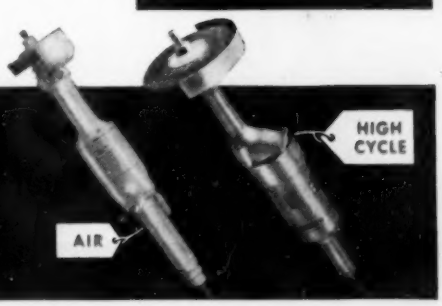



## New Rotor "02" Nutsetter cuts job time 50%

Nutsetters here, on radio chassis assembly, operated at 1200 rpm. Changed to Rotor S-02 LC Air Nutsetter . . . operates at 2500 rpm and handles easier. Cut time in half. Savings paid for Rotor tool in 7 weeks. Let's see what we can do for *you* with the new Rotor tools! Ask for Bulletin 46.

THE ROTOR TOOL CO.
CLEVELAND, OHIO

*UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS*



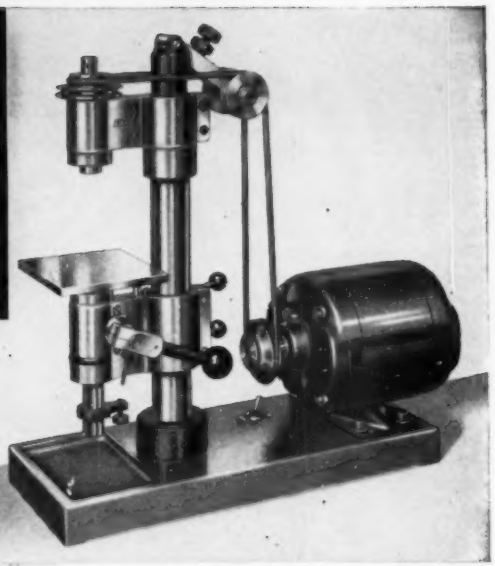



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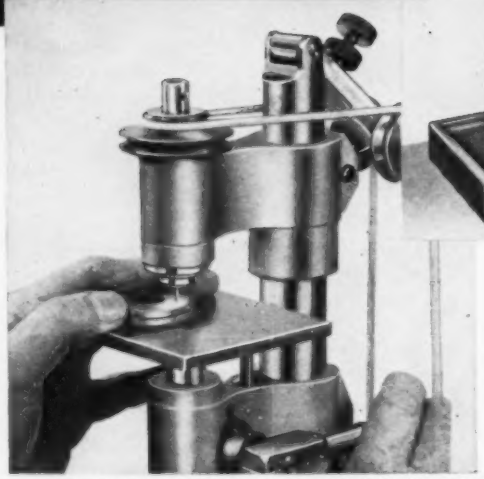
SMALL DRILLS MUST BE HELD
IN PRECISION COLLETS TO ASSURE ACCURACY

LEVIN® MICRO-DRILL PRESS

FOR VERY SMALL HOLES
DOWN TO .002"



In the LEVIN micro-drill press drills are held in precision collets. Runout is reduced to practically zero and drill breakage from this cause is eliminated. Collets are available in a complete range of sizes down to .1 mm (.004").



Size of table is 3-3/4" x 4". Maximum table travel is 1-1/2". Greatest distance between table and end of spindle 4". Preloaded ball bearing spindle with four speeds 1725, 2600, 3000, 4700 RPM. Motor 1/2 HP, 110V, 60C. The micro-drill press may also be had with a 3450 RPM motor, doubling the above speeds.

Send for catalog M describing complete line of micro-drilling equipment, collets, instrument lathes and precision tools.

LOUIS LEVIN & SON, INC.
3610 South Broadway • Los Angeles 7, Calif.

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NUMBERALL
CUTS THE COST OF STAMPING NUMBERS

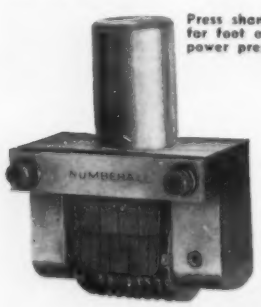
NEW MODEL 70

MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL Machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Perfectly aligned. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20.



Hand Shank



Press shank for foot or power presses

*Write for Bulletin TE-70*

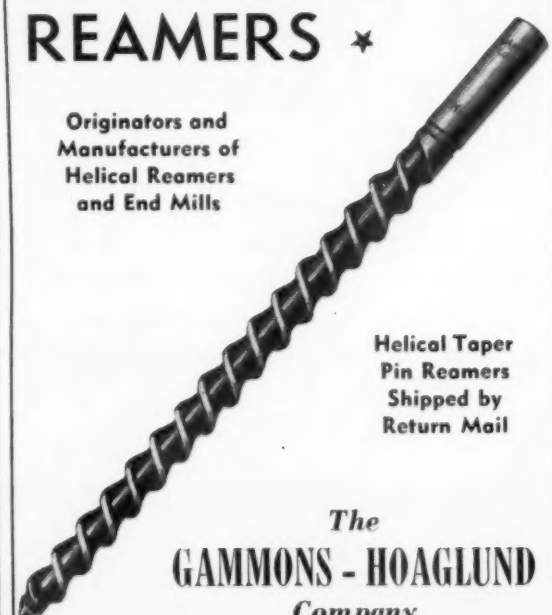
Can be furnished in 1/32" to 3/8" high figures, sharp face gothic or shaded roman style. Automatic Numbering Heads also can be supplied.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

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GAMMONS REAMERS *

Originators and Manufacturers of Helical Reamers and End Mills



Helical Taper Pin Reamers Shipped by Return Mail

*The*
GAMMONS - HOAGLUND
*Company*

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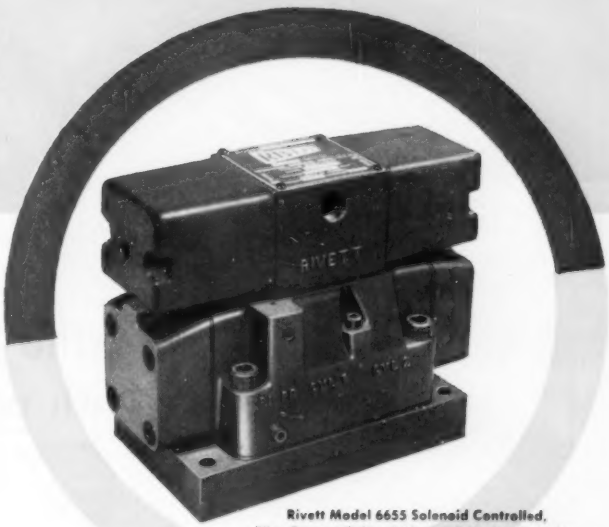
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# 6 sizes in 2



## of course!




Rivett Model 6655 Solenoid Controlled, Pilot Operated, Panel Mounted, Hydraulic Valve.

## Rivett Panel Valves

feature interchangeable sizes

By changing pipe tap size in steel subplate, the 1" basic valve may be used for either ⅜", ½", ¾", or 1" I.P.S.; and the 1½" basic valve for 1¼" and 1½".

CORRECT SIZE IS ALWAYS AVAILABLE



and here's another important feature!

**GREATER FLOW CAPACITY**

Flow capacities are rated at a higher G.P.M. at less velocity per ft. per sec. For example: the 1" size is rated at 28 G.P.M. at 15 ft. per sec.

*The Better You Know Hydraulics—*
*The Better You Like*

12 other good reasons tell why Rivett Hydraulic Solenoid Panel Valves are your best buy! Get the facts in this new catalog. Write today!

**RIVETT LATHE & GRINDER, INC.**
Dept. TE-7, Brighton 35, Boston, Mass.



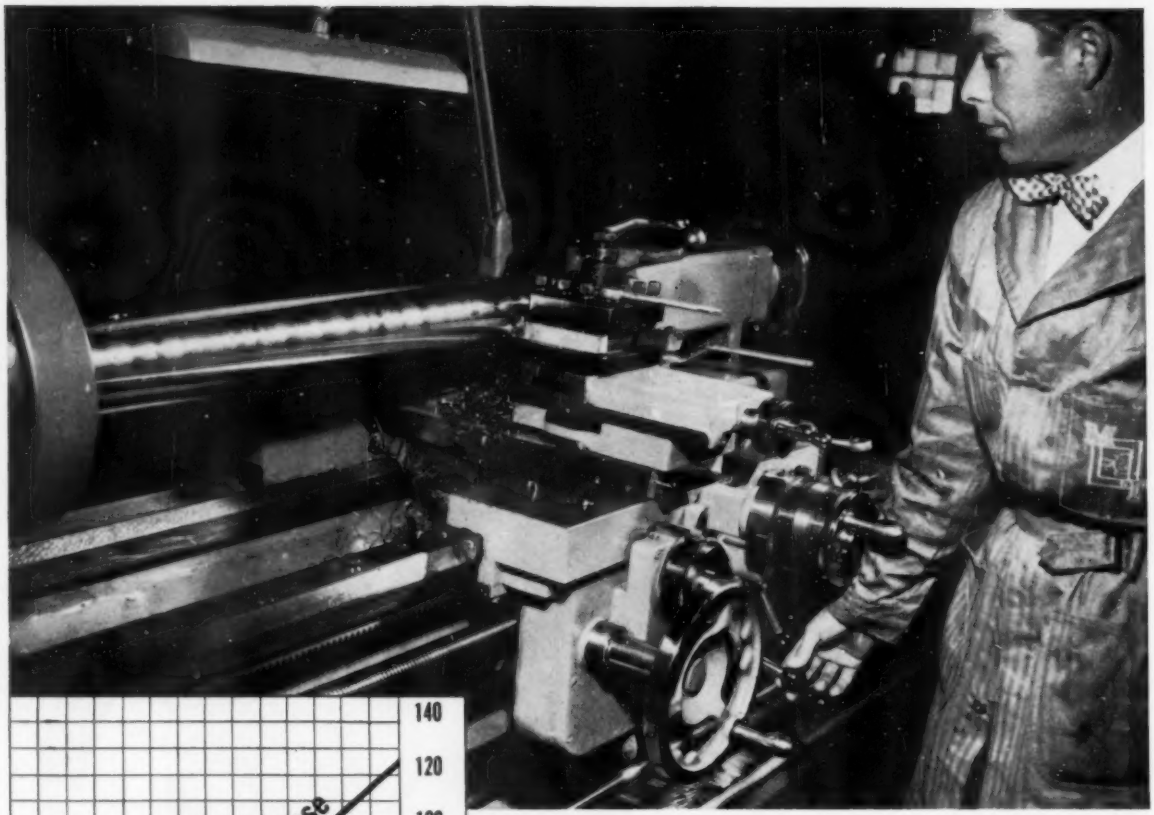

**RIVETT** furnishes a complete power package

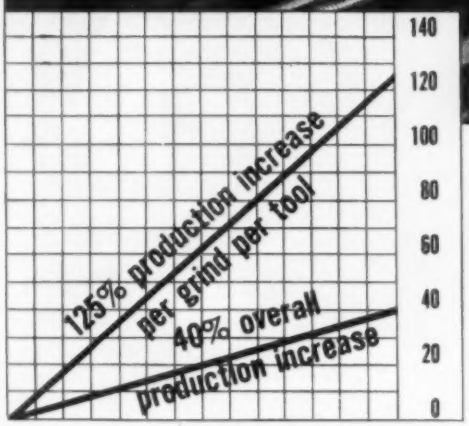
AIR AND HYDRAULIC—VALVES, CYLINDERS, POWER UNITS

*Member—National Fluid Power Association*



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# Lathe Shaft production *UP 40%* with new Firthite TXH Carbide

Wherever used, *new* FIRTHITE TXH Carbide is proving its competitive superiority . . . as at Boyé & Emmes Machine Tool Company, Cincinnati, for turning lathe shafts from 3 inch SAE 4140 un-annealed steel.

Here's what they found:

- Overall production went up 40%.
- Production increase of 125% per grind per tool.
- Twelve shafts per tool without regrinding.
- Only .0010 flank wear in 12 cuts.

Impressive? You bet! So much so that many tool engineers have acclaimed TXH as the most nearly "universal" grade of carbide yet developed. That's because TXH is an entirely new concept in carbide metallurgy . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before. And while a distinctly *premium grade,* TXH is not *premium priced!*

*You* try it. It's available from stock in all standard tips, tools and inserts.




**TXH ADVANTAGES**

- Higher hardness to strength ratio
- Improved impact resistance
- Wider range of applications
- Lower operating temperatures
- Higher edge strength
- Greater resistance to abrasion

R-317

**Firth Sterling**

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Firth-Heavy Metal
Chromium Carbides
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PARKER • MAJESTIC PM PRECISION MACHINES



# PARKER SPINDLES

## *FOR ANY MACHINE—FOR ALL APPLICATIONS*

**Following its development in 1915 and as a result of constant improvements through the years, the Parker Spindle has become one of the most widely used spindles in this country today on many makes of machines. The demand for speed and endurance in grinding and precision boring which the Parker Spindle makes possible has made Parker-Majestic Incorporated the leading manufacturer of precision spindles.**

**PARKER-MAJESTIC, INC.**

**147 Joseph Campau, Detroit 7, Michigan**

# AIR LIFT

*Faster!* *Safer!*






DOUGLAS AIRCRAFT uses ARO Link Chain Hoist in tooling shop at their Santa Monica plant. Shown here, bulkhead fixture being lowered onto flat car.

## *NEW* LINK CHAIN AIR HOIST!*

***ROLLER CHAIN ALSO AVAILABLE—ALL MODELS**

NEW Link Chain Hoist now added to the popular ARO line . . . up to 1000 lb. jobs!

**VARIABLE SPEED . . .** 0 to 38′ per minute . . . load can be inched or zipped.

**AIR-POWERED FOR SAFETY . . .** no spark hazard . . . explosion-proof motor . . . can't burn out or overheat . . . unaffected by dust or fumes.

**LIGHTWEIGHT . . .** only 29 lbs. . . . overall length 10½″. Can be converted to Roller Chain type if desired.

Also available, Roller Chain Hoists—2,000 lb., 1,500 lb., 1,000 lb., 500 lb., 300 lb., 100 lb.

*See Your ARO Distributor*

**THE ARO EQUIPMENT CORPORATION**

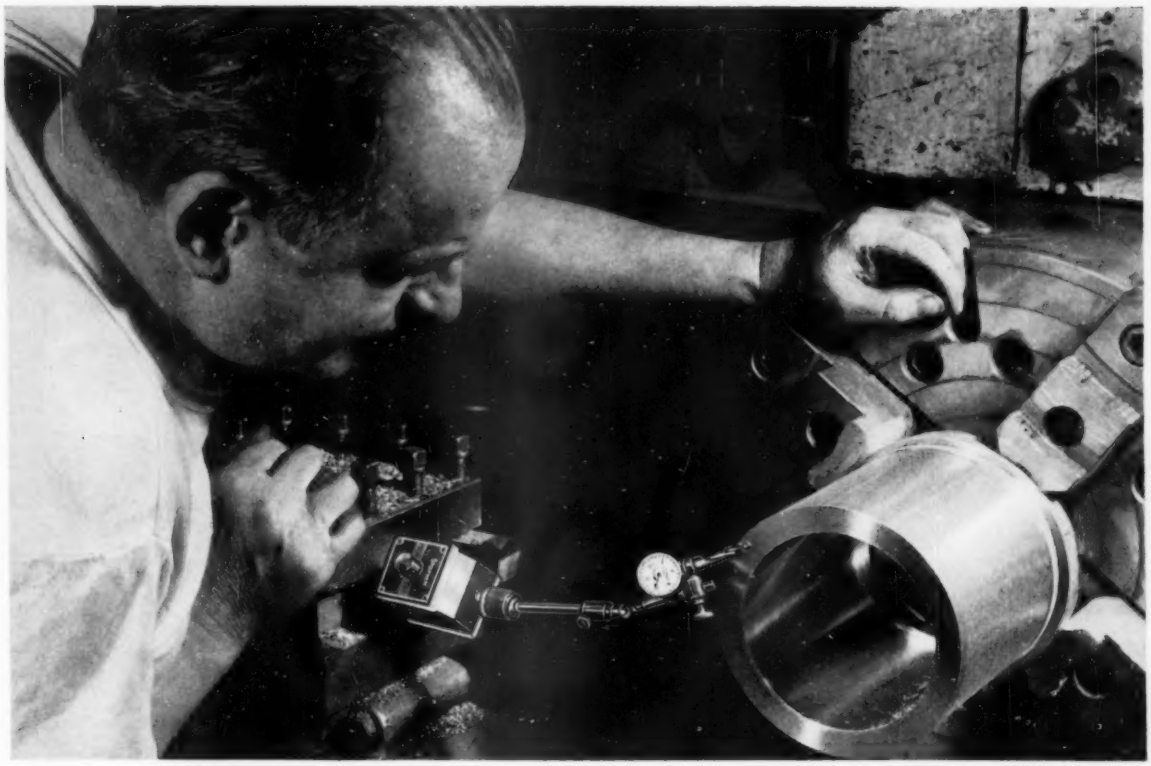
Bryan and Cleveland, Ohio

Aro of California, 4131 S. Grand Ave., Los Angeles 7
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**ARO®**

**AIR HOISTS**

**Also . . . Air Tools . . . Lubricating Equipment . . . Aircraft Products . . . Grease Fittings . . .**



# here's one way STARRETT helps you...

By constantly bringing out new and better precision measuring tools, Starrett helps you produce precision work faster and at less cost.

This new magnetic base indicator holder is an example. It's quick and easy to set up and adjust. It has an on-off push button which permits mounting the base with one hand, leaving the other free to position the indicator. It has universal adjustments including a fine adjusting screw for accurate final adjustments.

You expect *and get* an extra measure of value and performance when you specify Starrett precision measuring tools and instruments. Get the same full measure of quality by specifying *Starrett* when you buy dial indicators, steel tapes, hacksaws, hole saws, band saws, band knives, and precision ground die and flat stock.

All of these precision-made Starrett products are available through one convenient source of supply — your local Industrial Supply Distributor.

**NEW CATALOG NO. 27**

Shows the complete Starrett line. Ask your Industrial Supply Distributor or write for free copy. Address Dept. E, The L. S. Starrett Company, Athol, Mass., U. S. A.

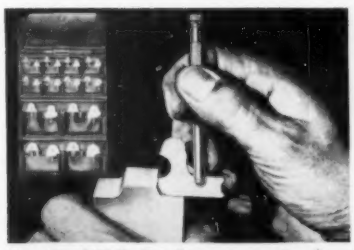
Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

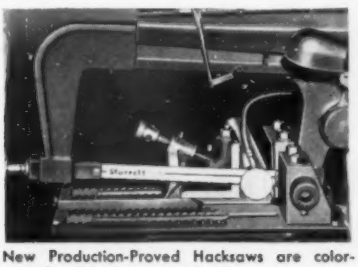
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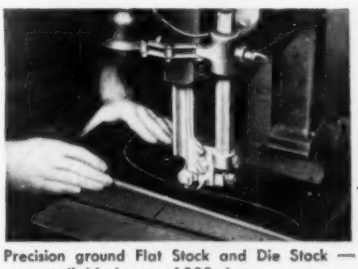
## here are many more...



New No. 167 Radius Gages — made of rust-proof stainless steel with Satin Finish.



New Production-Proved Hacksaws are color-identified for job-match selection.



Precision ground Flat Stock and Die Stock — now available in over 1000 sizes.

★ MINIMIZE TAP BREAKAGE! ★ INCREASE TAP LIFE!
★ GET MORE ACCURATE, BETTER-FINISHED THREADS!

# NEW DAVIS tap-saver

## Automatic Torque Control TAPPING HEAD

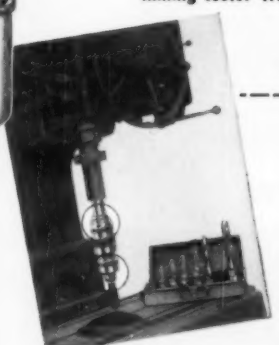



## adjusts driving torque to suit material, type of tool and size of tap

**Turn the material selector dial to the proper setting...insert the tool with its proper collet...and your TAP-SAVER tapping head automatically provides exactly the right driving torque for all working conditions!**

**What's more, this torque is always accurately maintained. Whenever resistance increases, controlled slippage in the overriding clutch within the tapping head compensates for it. Think what this means in terms of operating advantages! Tap breakage is virtually eliminated. Thread accuracy and finish are improved materially. And output rises profitably. Production time is also cut sharply as tools easily interchange in the TAP-SAVER'S quick-change chuck. A series of operations on the same hole can be completed without repositioning either spindle or the work – only the collet and tool are changed.**

**Investigate now—learn how the new Davis TAP-SAVER can solve many production problems for you and quickly pay for itself in decreased machining costs. WRITE FOR BULLETIN No. DB-160.**



## *Machining Advantages*

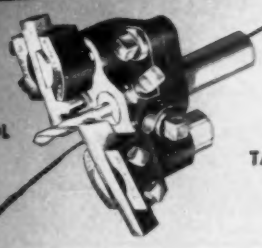
- Eliminates "forced," "chattered" and "stripped" threads as well as broken taps—no damage to starting threads when withdrawing tap.
- TAP-SAVER head does either right or left-hand tapping, drilling, reaming, spot facing and counterboring. Cuts hole time by half.
- One dial setting covers all work on any material. Absolute safety under all conditions with all tools, in through or blind holes.
- Three sizes of tapping heads are supplied as standard with Morse taper shanks Nos. 3 through 7. Special shanks or draw key slots for any machine are available on order. Each head furnished in steel box with three drill collets and seven tap collets in appropriate sizes.

DAVIS BORING TOOL DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wisconsin

# THE R and L LINE SAVES TIME



KNURLING TOOL



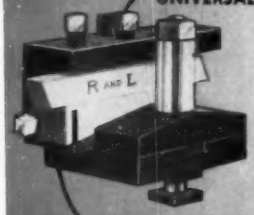
TURNING TOOL



TAP AND DIE HOLDERS



FLOATING DRILL HOLDER



UNIVERSAL TOOL POST



RECESSING TOOL

***Here's how R and L TOOLS pay for themselves***

These tools have been described as "tools a *particular* machinist would design for himself". Famous throughout the world for their time and labor-saving features . . . their durability . . . their quality, R and L TOOLS are truly masterpieces of the toolmaker's art.

- Speed Set-up Time
- Speed production
- Reduce rejects to absolute minimum

*Write for new catalog*

**R and L TOOLS**
1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS • RELEASING DIE HOLDER FOR ACORN DIES • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL

**R and L TOOLS**
1825 Bristol Street, Philadelphia 40, Pa.

☐ Send new catalog
☐ Please have representative call.

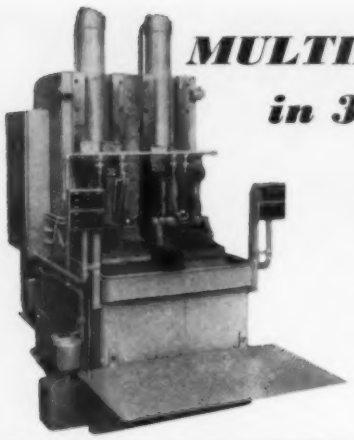
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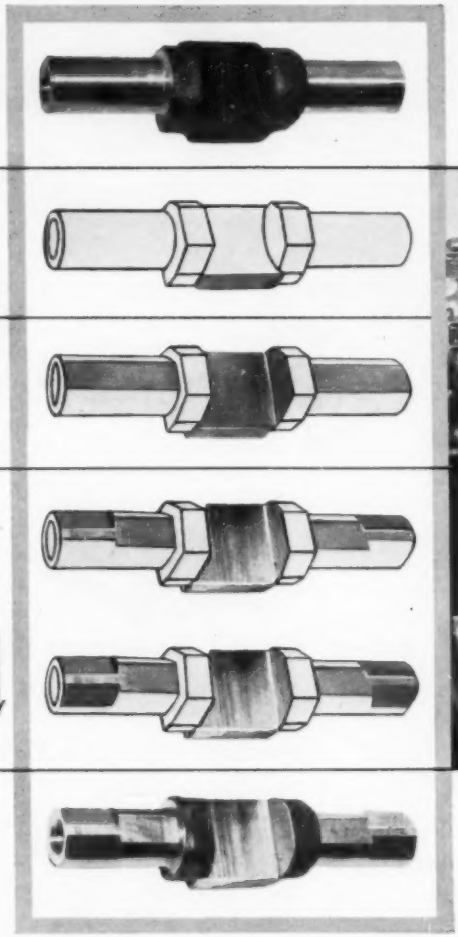
TE-7



# MULTIPLE SURFACES BROACHED

## in 3 operations on 1 machine!

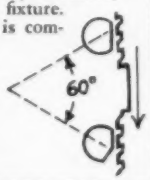
American TOOLING IS SIMPLE, EFFICIENT, ECONOMICAL

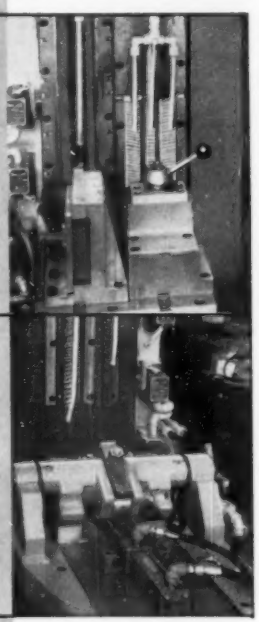


At the first of three stations on this American Dual Ram Broaching Machine, both sides of a pinion mate cross shaft are straddle broached to finished width. Sliding tables automatically move parts into broaching position and return for reloading.

Second station on the left hand ram moves part into position for simultaneous broaching of the sides and bottom of wide center slot and of the two flats on the O.D. of both ends of the shaft.

At the third station, two angular flats are broached on each end of the shaft in a single stroke of the right hand ram. Parts are clamped in a hydraulically actuated, trunnion type, work-holding fixture. As broaching of the first half is completed and a gap in the broaches is reached, fixture tilts automatically to position part for broaching the second flat.



**Production:**

OVER 170 PARTS PER HOUR
AT 100% EFFICIENCY

Here, a standard American broaching machine has been adapted, with relatively inexpensive tooling, to efficient, multiple operations that can be run on automatic or semi-automatic cycle. Versatility of the machine is unimpaired — it can be re-tooled easily for other purposes as later production requirements dictate.

American engineering can accomplish similar things for you. Whether your broaching needs call for relatively low cost tooling or for the highest degree of automation, American can best coordinate the design and building of the right machine, fixtures and broaches.

*Write or 'phone details of your requirements. Or write for Catalog 450.*

AMERICAN

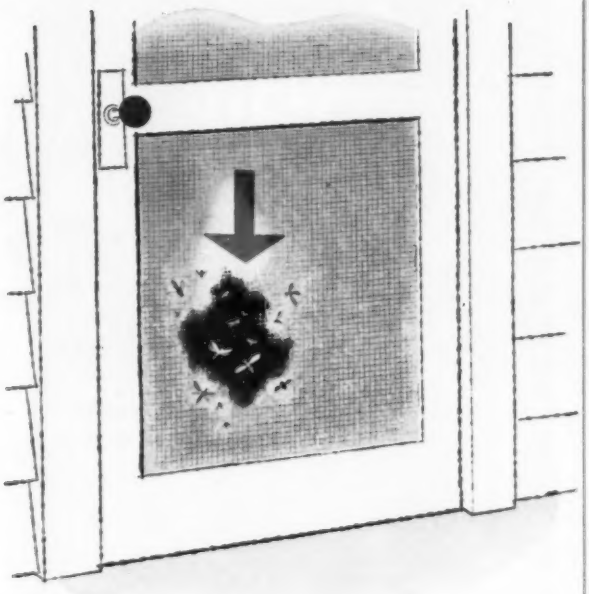
**American BROACH & MACHINE CO.**

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

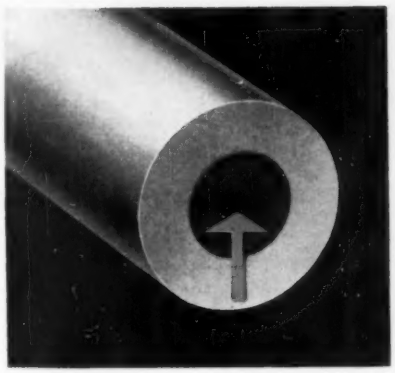
ANN ARBOR, MICHIGAN

SUNDSTRAND

**See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery**



a hole here is a nuisance...



a hole here is convenient

***Crucible Hollow Tool Steels*** eliminate the nuisance of drilling, boring, cutting-off or rough-facing of ring-shaped, tubular or bored tool steel parts. They save you money, too, by reducing machine time and scrap losses.

Crucible Hollow Tool Steels are produced in all of the famous Crucible tool steel grades . . . in bars or saw cut lengths to meet your needs. And they're available in almost any combination of O.D. and I.D. sizes. You can get these five grades "off the shelf" from your local Crucible warehouse: KETOS oil-hardening . . . SANDERSON water-hardening . . . AIRDI 150 high-carbon, high-chromium . . . AIRKOOL air-hardening . . . NU DIE V hot work.

See how Crucible Hollow Tool Steel Bars will save you hours of shop time. Call your Crucible representative. *Crucible Steel Company of America, The Oliver Bldg., Mellon Square, Pittsburgh 22, Pa.*

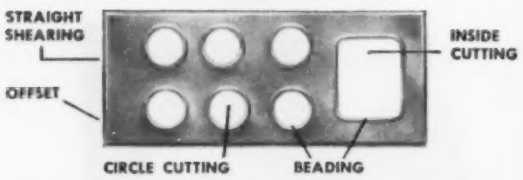
**CRUCIBLE** first name in special purpose steels

**Crucible Steel Company of America**

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

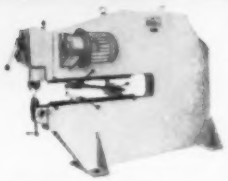
# PULLMAX METALWORKING IDEAS

*This steam table top was made completely on a PULLMAX*




**Pullmax machines have the versatility to do all of the metalworking jobs in your Model Shop, Engineering or Maintenance Departments.**

One machine does straight shearing, inside or outside circle cutting, design cutting, inside square cutting, beading, joggling, slot cutting, louver cutting, dishing, edge bending and flanging. Seven sizes of machines cut up to 11/16" in mild steel. Ask for a demonstration.



See us at the Southeastern International Industrial Exposition; Atlanta, Ga., May 16-25

**Write for the Pullmax Catalog on Money-Saving Metalworking ideas.**



**AMERICAN PULLMAX COMPANY INC**

2451 North Sheffield Avenue • Chicago 41, Illinois

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FREE BOOKLET




. . . tells how diamond abrasive assures better metallographic specimens.

# ELGIN DIAMOND

***. . . for dependable metallographic specimens, faster***

Precision graded Elgin Diamond assures a consistent surface for examination and saves time in polishing metallographic specimens. Precision graded diamond particles cut clean, eliminate "smearing", preserve grain boundaries. Count on Elgin Diamond for uniform polishing results in all diamond abrasive applications . . . it's the standard for industrial diamond abrasive quality. Write today for this booklet on "Metallographic Polishing With Diamond."

**ABRASIVES DIVISION, DEPT. S**

**ELGIN NATIONAL WATCH COMPANY**

ELGIN, ILLINOIS

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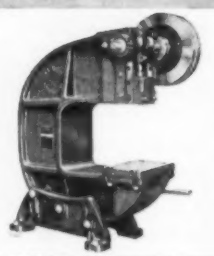


# KENCO

*1½ to 15 ton*

**PUNCH PRESSES**

## ...dependable



You get precision punching and high volume *consistently* with a Kenco press. It's built to eliminate downtime — with long-wearing parts and trouble-free assemblies. Needs adjustments seldom . . . replacements practically never. Write for literature.

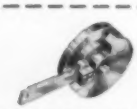
**KENCO MANUFACTURING CO.**

***Mfrs. of Precision Machinery and Accessories***

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Extra long ram ways permit full use of guiding area to insure precision punching.



High strength castings used on clutch collar (illustrated), frame and ram ways — for extra rigidity and wear.

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# IT'S NEW

IT LISTS ALL PRODUCTS

COMPLETE CATALOG NO. 56

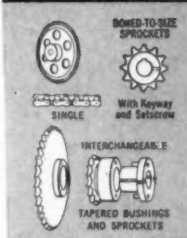



576 pages with complete information on 7124 standardized products FROM STOCK!

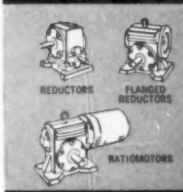
GEARS




SPROCKETS & CHAIN




SPEED REDUCERS




BEARINGS



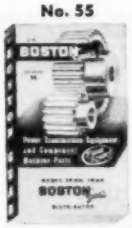

OTHER PRODUCTS

UNIVERSAL JOINTS
COUPLINGS • PULLEYS

50 pages of engineering data for drive design

REPLACES THESE THREE CATALOGS

No. 55



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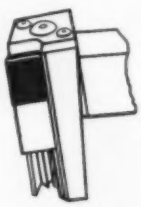
# V-R TOOLHOLDERS CUT

## *Savings Range from 10% to 200%!*

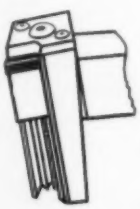
### V-R Longhead Toolholders Eliminate Carbide Waste



V-R longhead elevator type toolholders will handle any standard cemented carbide inserts up to 1½" in length.



This insert has been reground as many times as possible for use in ordinary toolholders.



In a V-R toolholder, the insert can be reground until it is no longer thick enough to take the cut required.

**V-R toolholders** cost less to use because of unique design features not found in any others:

**Less Downtime** because you do not have to reposition the toolholder when you replace or index inserts. Change of inserts is fast and easy — there are no loose pieces to fall out.

**Lower Carbide Cost.** You can consume up to 90% of a long insert, nearly twice as much as with other toolholders.

**No Grinding** when you use V-R toolholders and throw-away inserts.

**Long-Life Chipbreakers.** V-R chipbreaker plates are made of a special cast alloy (not steel), chosen for its exceptional wear and shock resistance characteristics.

***NEW CATALOG FREE ON REQUEST***

**. . . new Catalog No. VR-437 gives complete data on the design and construction of all V-R toolholders . . . contains dimensional drawings, parts lists and prices. Also describes V-R carbide inserts in grades to meet your needs. Get your copy now. Call your V-R Representative or Distributor, or write to Vascoloy-Ramet Corporation, Waukegan, Illinois.**



## *Styles to handle 90% of Your Machining Operations*

**Standard Brazed Tool** | **Comparable Toolholder**

AR-AL



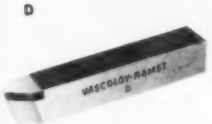

TAPR-TAPL



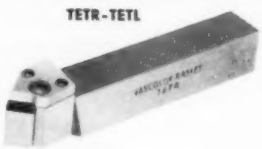

**Straight Turning**

**Standard Brazed Tool** | **Comparable Toolholder**

D




TETR-TETL




**45° Lead Angle Turning**

BR-BL




TBPR-TBPL




**15° Lead Angle Turning**

FR-FL




TFPR-TFPL




**Straight Facing**

E



TDTR-TDTL




**30° Lead Angle Turning**

FBR




SFPR-SFPL




**15° Lead Angle Facing**

# CARBIDE TOOLING COSTS!




**FOR INSERTS UP TO 1½" LENGTH**
(Negative Rake)




**FOR THROW-AWAY INSERTS**
(Negative and 6° Positive Rake Styles)

Right and left hand styles for: straight turning; straight facing; 15°, 30° and 45° lead angle and plunge turning, and chamfering.

## *Fastest, Simplest-to-use Toolholder There Is!*



**Insert is clamped between adjustable elevator and fixed position chip-breaker plate. That's all there is to it!**

**Insert is removed and replaced in seconds. It is automatically indexed just by slipping it in place!**

**Works easily in any position, thanks to fixed position chipbreaker plate and socket in each end of main screw.**

*MANUFACTURERS OF:*
CEMENTED CARBIDES, TOOLHOLDERS and TANTUNG® CAST ALLOY CUTTING TOOLS

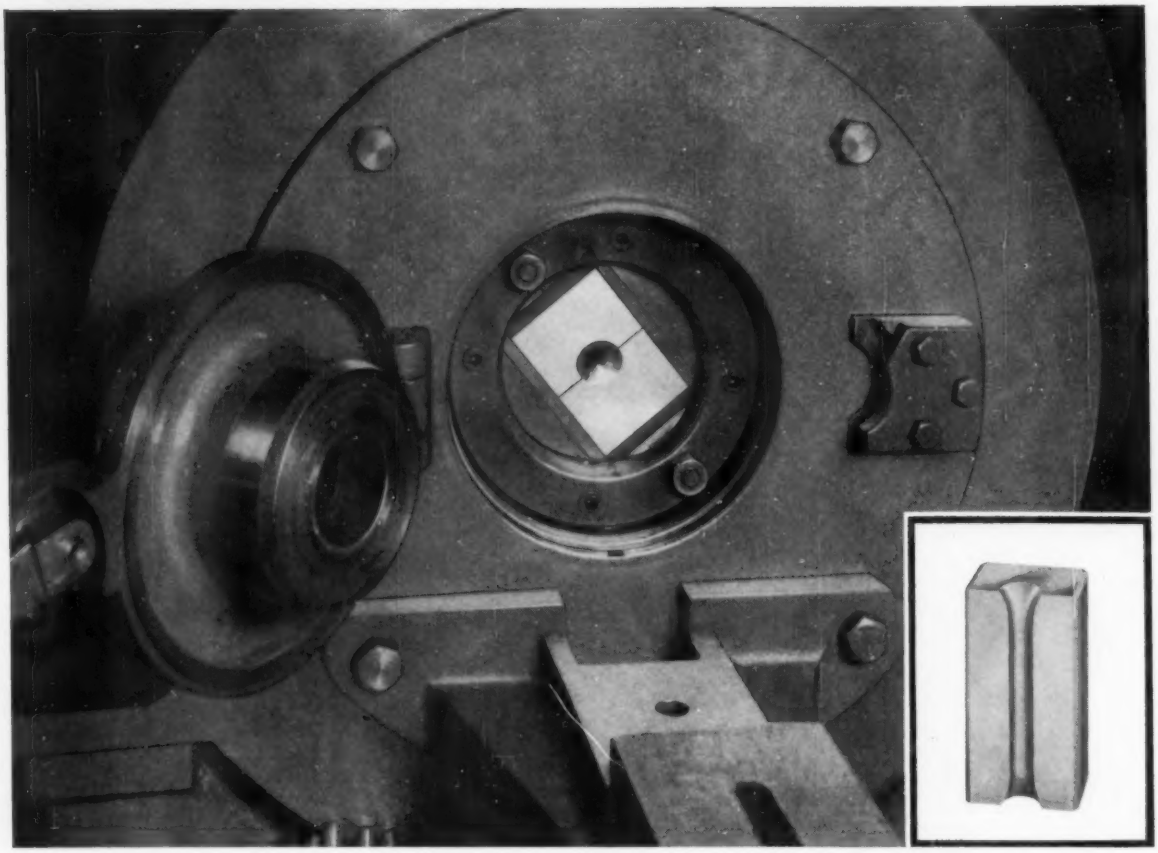
# Vascoloy-Ramet Corporation

SUBSIDIARY OF PANSTEEL METALLURGICAL CORPORATION

**884 Market Street • Waukegan, Illinois**



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# KENNAMETAL* Dies swage up to 50 times more pieces than steel

## with more accurate dimensions and better quality

By switching to dies made of Kennametal Grade K90, a manufacturer of hand tools has obtained these important benefits on a hot swaging operation:

- increased production of swaged steel alloy rods from 100 to 1000 pieces between dressings . . . machine down time greatly reduced.
- swaged pieces are now more uniform and of better quality.
- the Kennametal dies are outlasting the steel dies 30 to 50 times.

Although the Kennametal die blocks cost about five times more than the steel dies previously used, they quickly pay for themselves and show substantial profits on the investment.

As Kennametal dies and die sections are showing similar results on many types of operations, why not select Kennametal for your next die parts . . . for blanking, compacting, cold heading, cupping, drawing, forming, perforating, piercing, slitting, stamping or swaging.

You can choose from Kennametal's "90 Series" with six grades or the exclusive non-galling "80 Series" with three grades. These grades provide a range of carbides that meet the specific requirements of any die application.

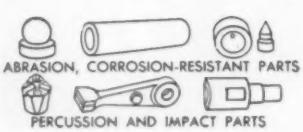
A Kennametal die engineer will gladly work with you or your die maker in applying the right grade of Kennametal for your dies. Call him at your nearest Kennametal office or write to KENNAMETAL INC., Latrobe, Pennsylvania.

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## ALL TYPES ...
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# SUBLAND

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- DRILL COUNTERBORE
- DRILL REAMER
- DRILL DRILL

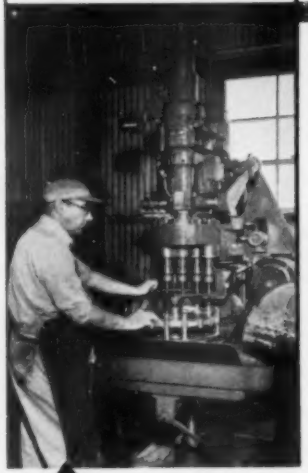
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tapping production DOUBLED in pieces per hour with longer tool life

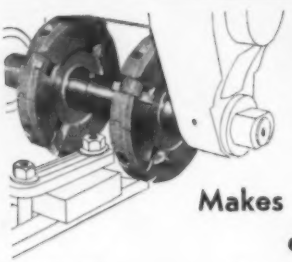
KAUFMAN

There's a good reason for that kind of a record. *Kaufman specializes in building tapping machines* . . . highly-precisioned machines designed for high production runs or for the versatile, multiple machine shop requirements. For complete information on how you can reduce production costs in your plant . . . send prints and samples of your work to

**KAUFMAN MFG. CO.**

553 S. 29th St. Manitowoc, Wisconsin

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**New-Field**

UNIVERSAL FLY CUTTER

Makes 4-6 cuts in one operation!

Uses standard bits!

Straddle milling with New-Field cutter









These are only a few of the many different types of cuts possible with a New-Field Universal Fly Cutter.

No need now for special cutters for many types of milling if you use the New-Field Universal Fly Cutter. One New-Field cutter using any type of high speed steel or carbide bits makes multiple cuts in one operation. Standard bits are easily reground or replaced when needed for other work. Down time is cut to minimum.

New-Field Cutters fit all standard arbors on horizontal or vertical mills or drill presses, turn to any required speed, have adjustable bits to permit slots of any shape from 3/16" to 2" for fly cutting. Available in 4", 6", 8" and 10" sizes, also 6" and 8" heavy duty size designed especially for Shell End Mill Arbors. Write today for details on this versatile, money-saving tool!

**NEW-FIELD MACHINED PARTS CO.**

210 W. 7th St., Los Angeles 14, Calif.

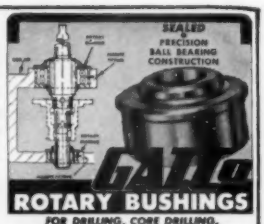
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USE
GATCO ROTARY BUSHINGS
WITH
Your Boring Bars
FOR
*ACCURACY*
and
*SAVE WEAR*

Eliminates expensive tool construction – Reduces tool wear – Prevents seizure and pilot breakage – Especially adapted where precision is required.

ORIGINATORS OF THE ROTARY BUSHING

**GATCO ROTARY BUSHING CO.**




The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

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**STANDARD FLUSH PIN GAGES**

Precision Built
of Precision Ground
Oil Hardened
Tool Steel



Can be Furnished with Indicator Mountings
Completely Ground to Your Specifications and Ready for Use
No Design Necessary
Deliverable from Stock

Write for Latest Catalog as well as our Automatic Free Service.
Representatives Wanted for Most Industrial Areas

**UNION GAGE CORP.**

712 Lehigh Avenue Tel. Murdock 6-9150 UNION, N. J.

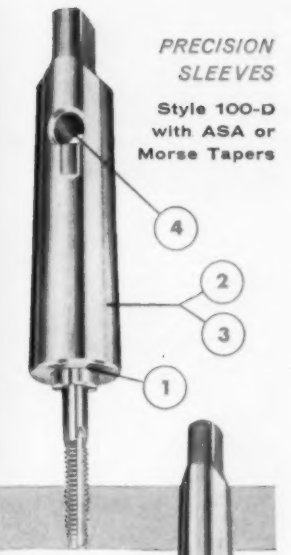
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# Scully-Jones
# PREMIUM QUALITY SLEEVES, SOCKETS
## *now even better!*

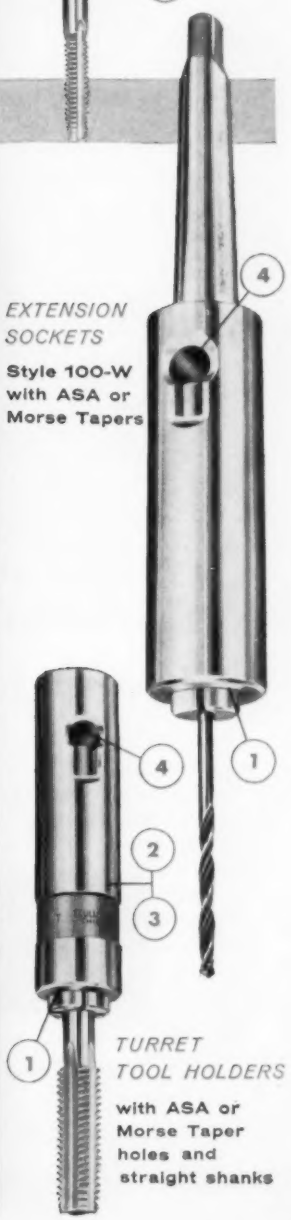
New "keyhole-type" drift slot eliminates the need for hammering on conventional drift and speeds tool ejection.

| These benefits . . . | for these reasons | . . . result from these PREMIUM features |
|---|---|---|
| INCREASED ACCURACY | Run true in the machine spindle | 1. Precision-finished to high degree of concentricity. |
| | | 2. Hardened surfaces resist nicking and burring. |
| INCREASED PRODUCTION | Faster tool changes | 3. Properly hardened and precision-ground surfaces assure perfect fit in spindle. |
| | Guard against cutting tool breakage | 4. New "keyhole-type" drift slot simplifies ejection of chucks and tools—eliminates pounding. |
| | Longer tool life | 5. Outlast several soft sleeves or sockets—proper steel and hardness prevent twisting, nicking, and spindle damage. |
| REDUCED TOOL COSTS | Adapt your present machines and cutting tools for wide range of operations | 6. Convert any Morse Taper hole and shank to a smaller or larger taper. |
| | | 7. Three series of sockets and turret tool holders extend spindles and turrets to reach otherwise inaccessible machining locations. |




*PRECISION SLEEVES*

**Style 100-D with ASA or Morse Tapers**




*EXTENSION SOCKETS*

**Style 100-W with ASA or Morse Tapers**

*TURRET TOOL HOLDERS*

**with ASA or Morse Taper holes and straight shanks**

SCULLY JONES

*Call your Scully-Jones factory-trained representative or distributor for complete information and prices.*

***PRECISION HOLDING TOOLS***

*"Precision Holding" for holding precision*

Scully-Jones and Company, 1915 South Rockwell St., Chicago 8, Ill.




Hardened areas show darker at ends of rocker arm.

## ...using a Lindberg 50 KW High Frequency Unit



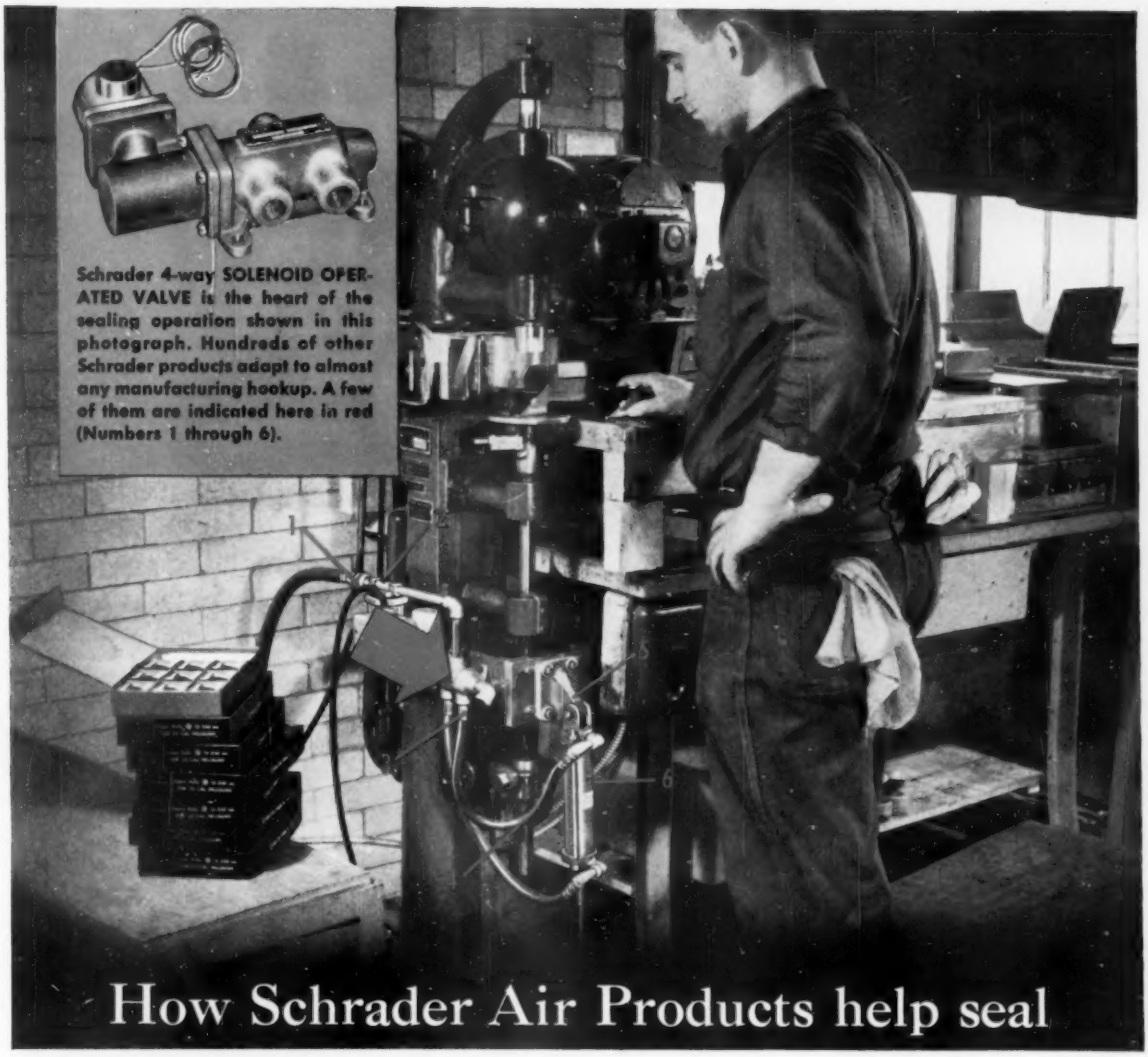
In Detroit, a leading manufacturer of prestige autos increased production of rocker arms 300% by switching to a Lindberg 50 kw high frequency unit with a new work fixture. Production is now 1550 per hour . . . with no rejects due to unit failure.

Selective hardening of these pearlitic malleable iron rocker arms provides wear resistance from valves and push rods. A sharp cutoff of the hardness is necessary because the center hole must be kept soft for further machining.

Lindberg high frequency units give continuous 24 hour a day operation with a maximum of dependability. If you have an induction heating application, you'd do well to talk things over with a Lindberg engineer.

**LINDBERG** *HIGH FREQUENCY DIVISION*

Lindberg Engineering Company • 2447 West Hubbard Street • Chicago 12, Illinois




# How Schrader Air Products help seal

## *5000 pellet boxes per day–3 times faster!*

Box sealing is a common operation performed by compressed air. Just how speedy it can be is demonstrated at a New York arms manufacturing plant, where 5000 boxes of pellets are crimped tight each day. The back-breaking job of crimping by foot power is eliminated, and the operator does not become fatigued.

Wherever operations are automated—in holding or positioning work, moving scraps or chips, or synchronizing actions—air can help. By making these steps automatic, more efficient manufacturing is achieved.

In many cases this can be done more economically with Schrader Air Products than in any other way. Upon request, Schrader engineers will assist you in planning for the most efficient use of air and in selecting the products best suited to your applications. Outline your problem to us . . . we'll be glad to help you. Or, send for the latest informative booklets which show Schrader Air Products that will help you increase production—economically.



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*Division of Scovill Manufacturing Company, Incorporated*
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FIRST NAME IN THE USE OF AIR
FOR INDUSTRIAL PRODUCTION AND CONTROL

# TRIPLE ECONOMY *WITH* HELLER SAWING OPERATIONS

**WHEN YOU HAVE ALL THREE UNITS FROM ONE SOURCE**

## 1 THE COLD SAW




MODEL SSH-630-A
AUTOMATIC COLD METAL
SAWING MACHINE

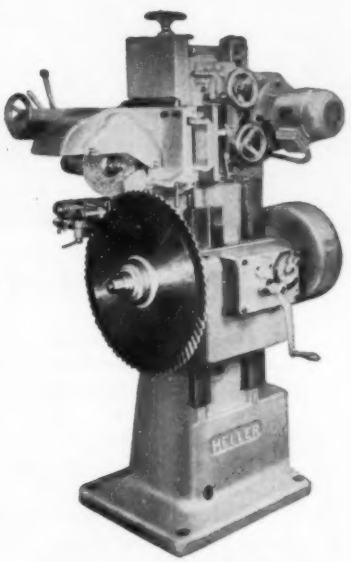
**TRIPLE ECONOMY**
***with* HELLER**

1. The Cold Sawing Machine
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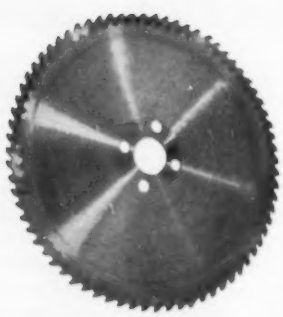
Economies are effected on every operation involved in cold metal sawing by taking advantage of the complete service available through Heller.

The specific savings offered by the use of the combination of Heller Cold Metal Saws, Heller Blade Sharpeners and recommended Sawblades becomes accumulative when used with each other.

## 2 THE SAW SHARPENER




MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

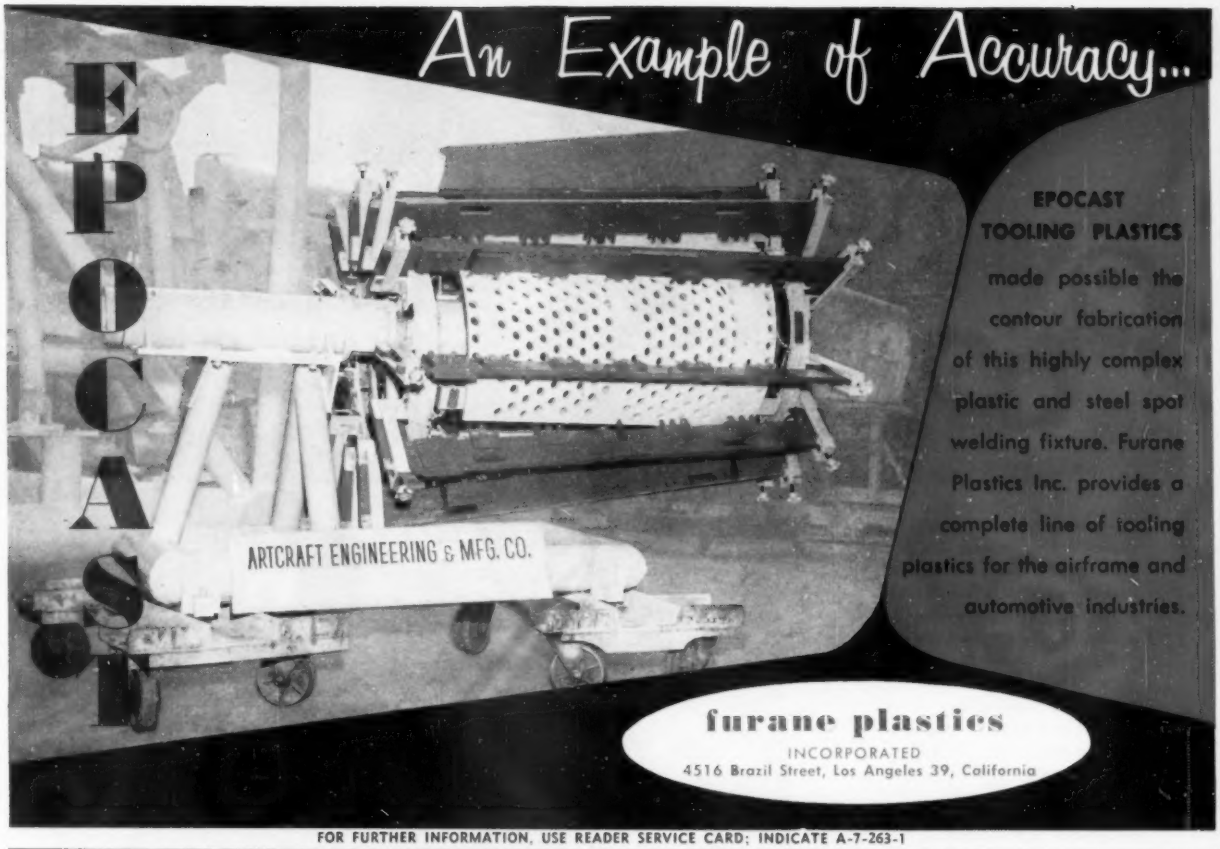


HELLER GIVES YOU COMPLETE SERVICE
WITH EXACTLY CORRECT BLADES.

## 3 THE SAW BLADE

**HELLER MACHINE COMPANY**, 114 Liberty St., New York 6, N. Y.

**KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES**




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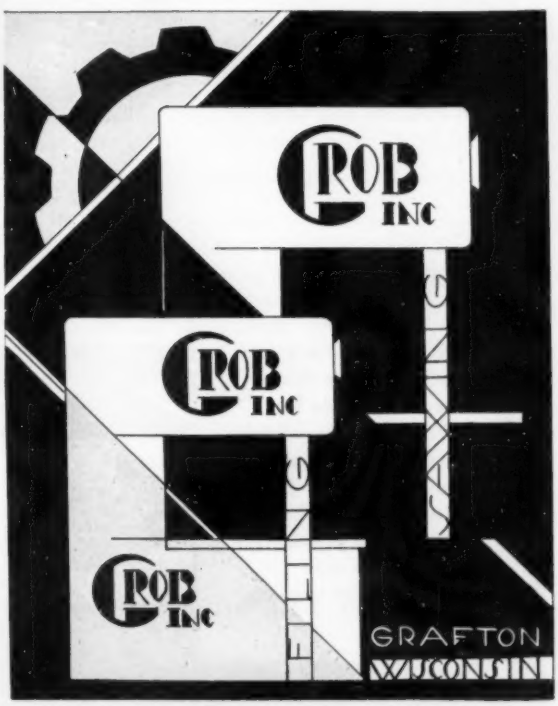

FREE—New Bulletin T-1 shows, describes VAILL tube end forming machine VERSATILITY for . . .

Beading • Flaring • Flanging • Sinking
Expanding • Grooving • Threading • Reducing
Double Lap Flaring • Double Lap Flanging

on Tubing up to 6" Diam.

THE VAILL ENGINEERING CO.
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# dixi 60

## horizontal optical jig borer

*with 5 optical microscopes*

**DESIGNED AND BUILT FOR:**

**VERSATILITY**
*Optical settings for operations in all planes and compound angles . . . Equally suitable for tooling, short-run or production work . . .*

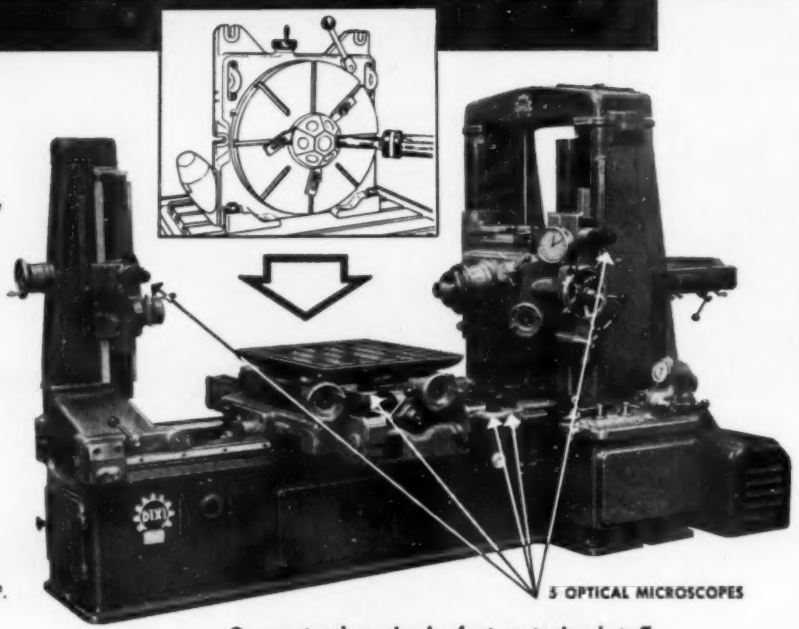
**ACCURACY**
*Overall accuracy of .0002"*

A precision machine for *JIGLESS* boring, facing, milling, and drilling work, in all planes. Built-in 360° optical rotary table, 28¾" x 32⅜". All spindle and table settings by optical microscopes. Infinitely variable hydraulic feeds. Mechanical spindle feeds with automatic depth stop. #40 taper spindle-speeds infinitely variable to 1400 R.P.M. Special features eliminate effect of spindle overhang on accuracy.

**DIXI 450 PRECISION OPTICAL CIRCULAR DIVIDING TABLE**

*Direct readings of 1 sec.*

(See insert picture above) rigidly mounted (not tilting) on built-in rotary table permits holding close tolerance relations between bores in all planes, including bores at compound angles. ALL IN ONE SET-UP. All sides of the work piece except the mounting face machined in one set-up.




- ***Guaranteed service by factory trained staff***
- ***Engineering staff available for consultation***
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DIXI 60 now in wide use in leading Aircraft and Manufacturing Plants throughout the United States.
Names available upon request.

**SEE THIS VERSATILE MACHINE IN OPERATION**

**at our New York or Cleveland Show Rooms. Write for Complete descriptive literature and prices to Department 21. Catalogues on additional production equipment also available on request.**

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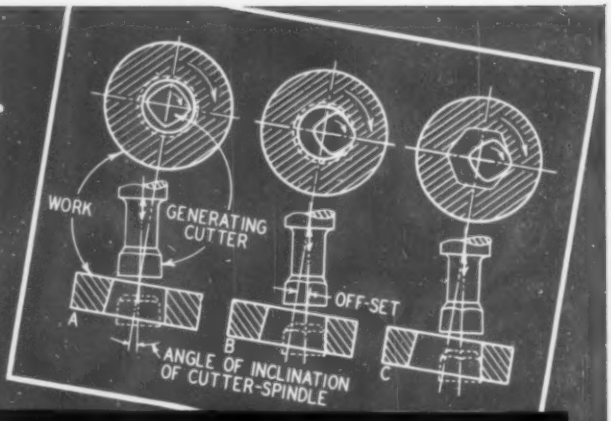
*A Division of Machinery Builders, Inc.*

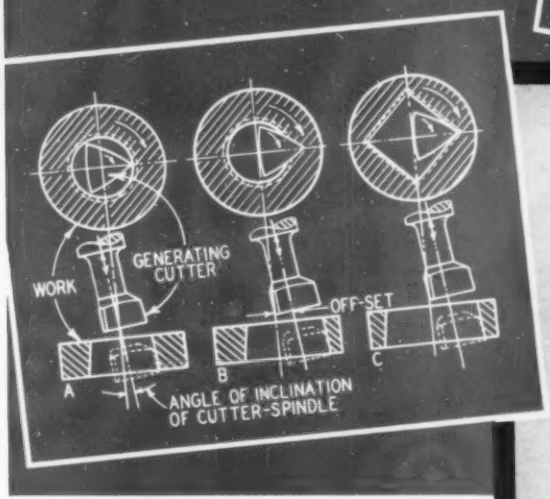
475 Grand Concourse, Bronx 51, N. Y.

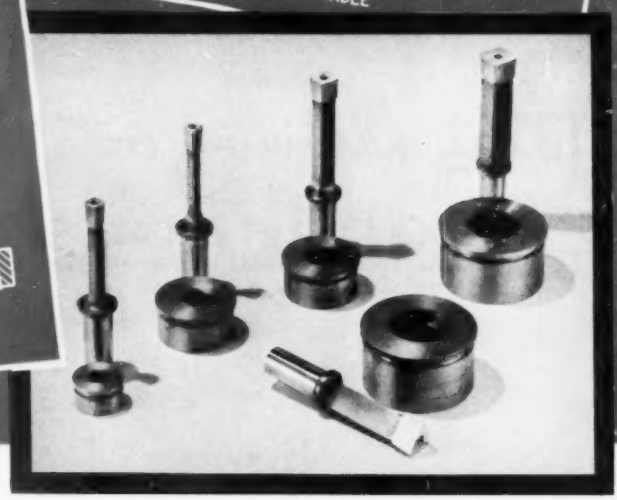
*Over 20 years experience in designing & building machinery*

Phone: MOtt Haven 5-0900

# What every designer should know about THE ART OF GENERATING



Generating offers designers many advantages in producing an almost unlimited variety of contours. Produced by the relative motions of points, lines, or surfaces, all generated profiles are combinations of two basic surfaces: curved and straight.

Generating with a reciprocating cutter on the Fellows Gear Shaper is a low-cost method of producing a wide range of symmetrical or irregular contours, either internal or external. Gear Shaper versatility provides a choice of generating techniques—employing a cutter form conjugate to work shape, introducing a variable movement between cutter and work, or a combination of both methods.

Shown above are some trim dies and the cutters used to generate them: three-sided cutters generate the square holes and four-sided cutters the hexagonal holes. Cutter sides are curved surfaces conjugate to the straight surfaces on the dies. The drawing shows the steps in generating. A special bed tilting mechanism in the Gear Shapers provides a simple adjustment for the required taper angle on the dies.

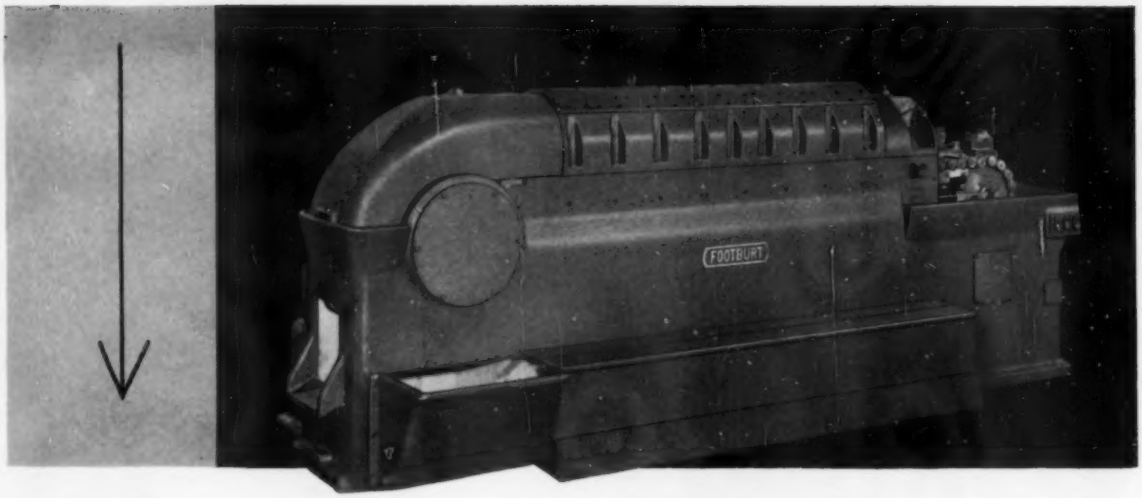


Many other examples of interest to designers are shown in the booklet, "The Art of Generating with a Reciprocating Tool." Just write any Fellows Office.

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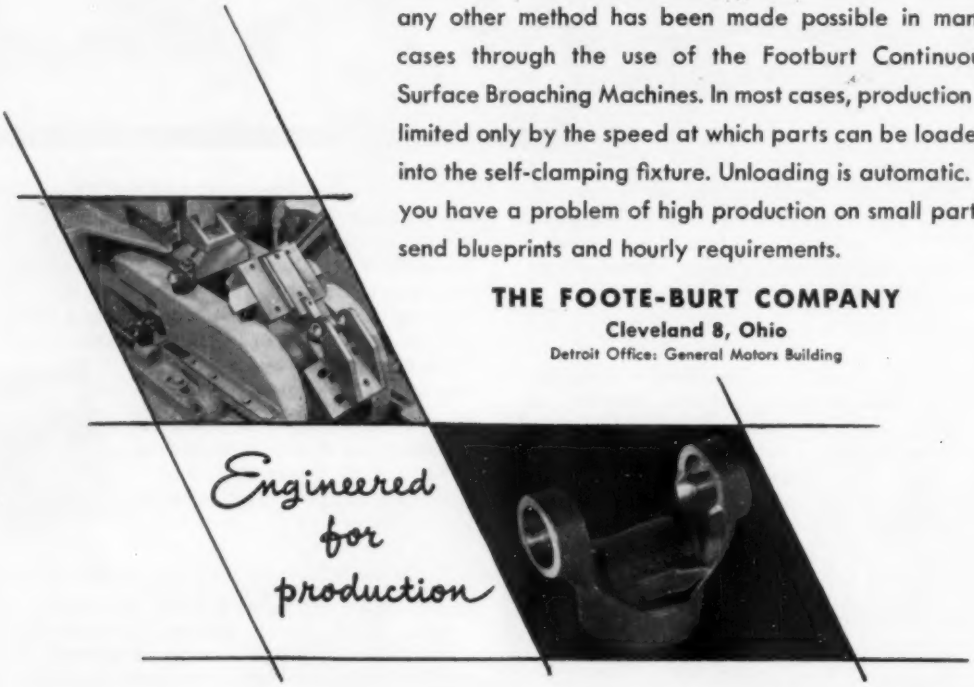
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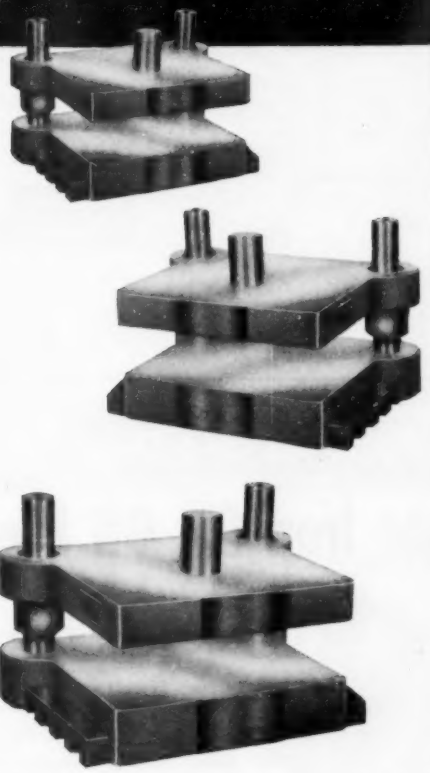
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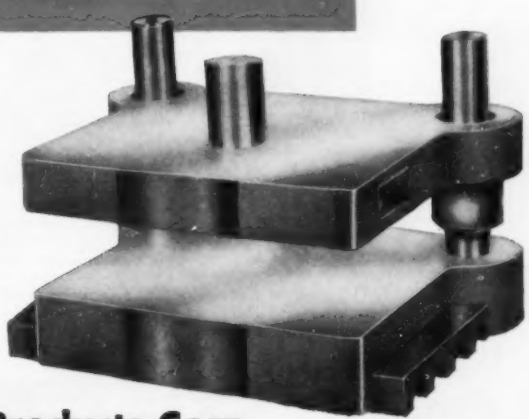
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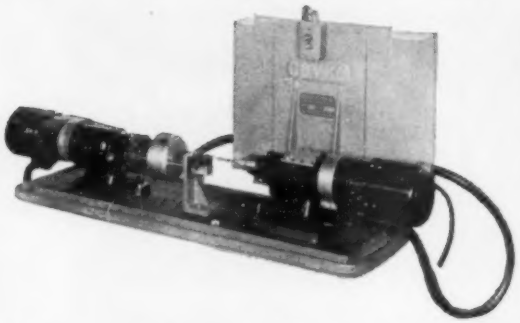
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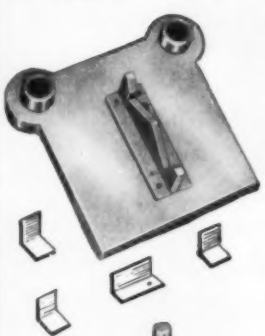
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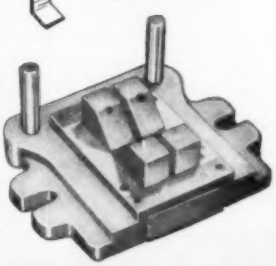
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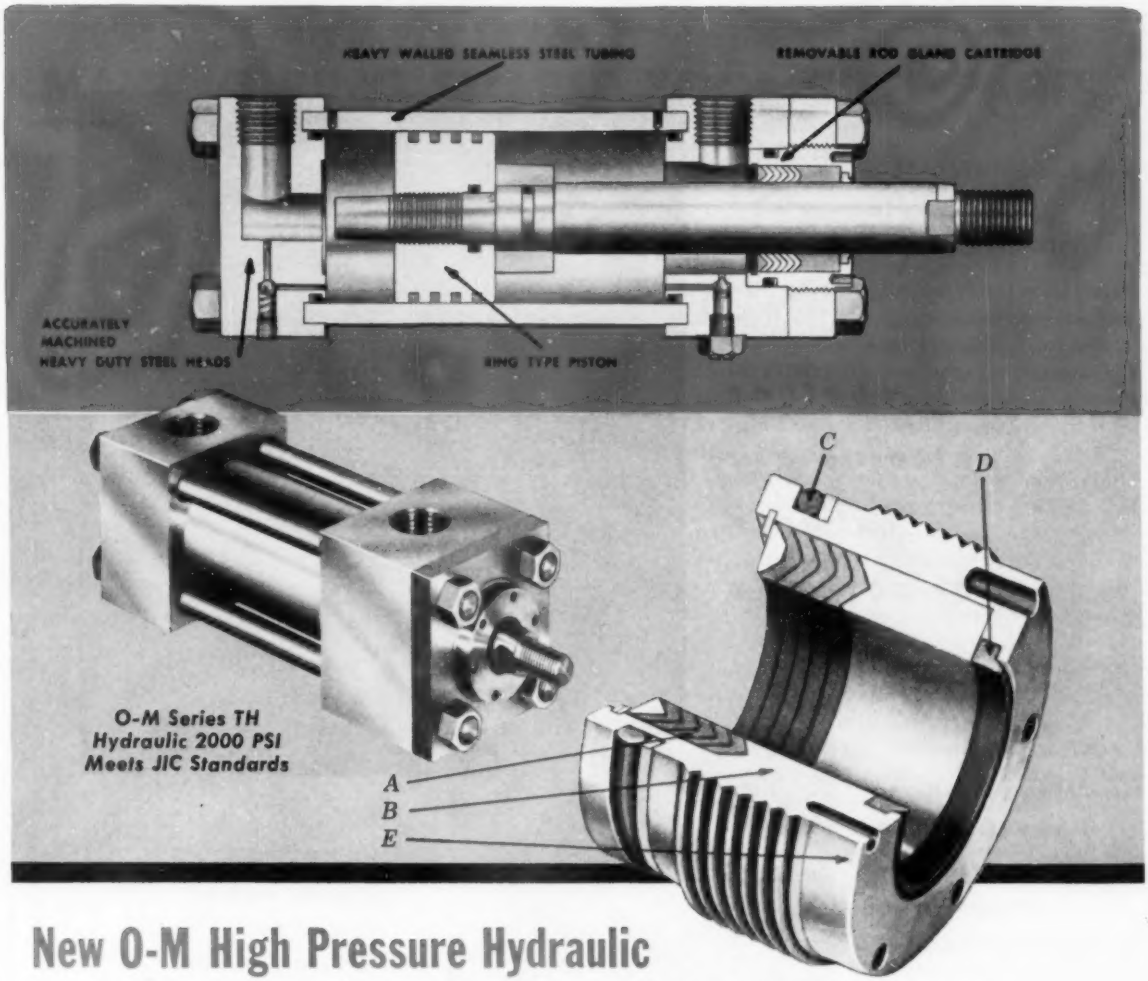
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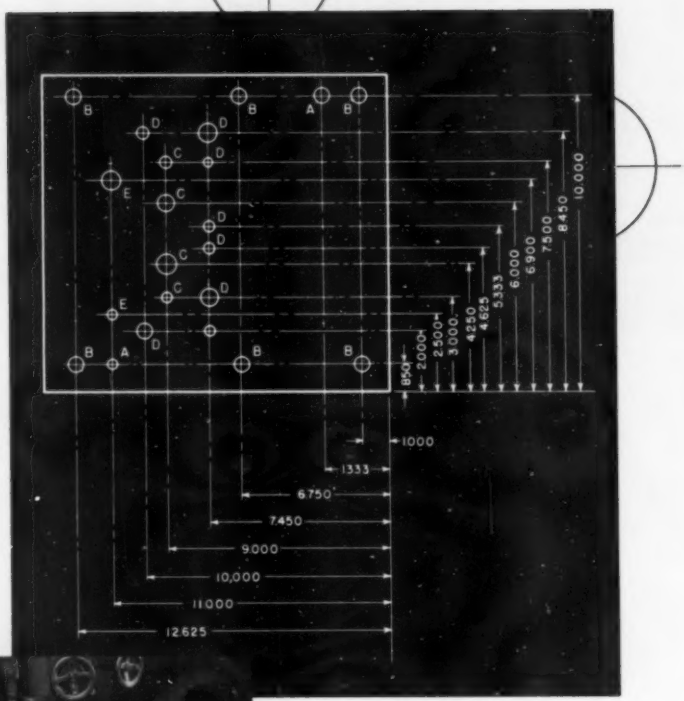
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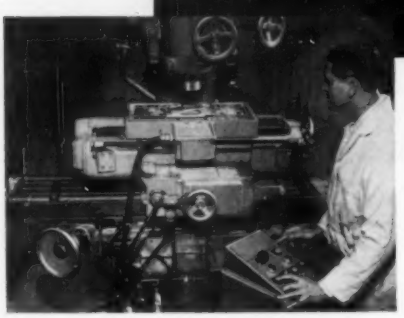
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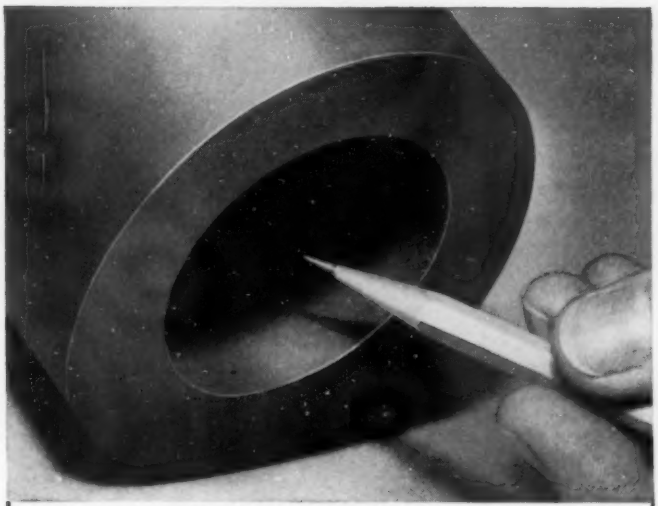
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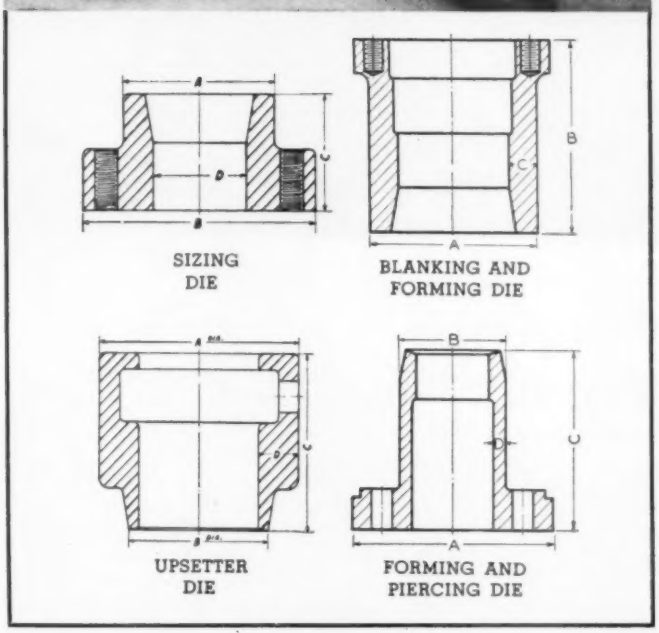
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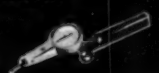
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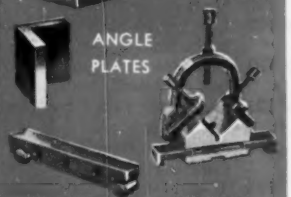
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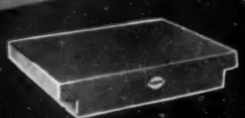


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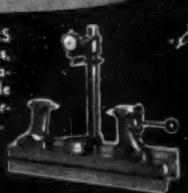


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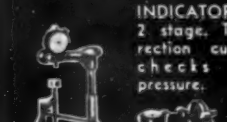
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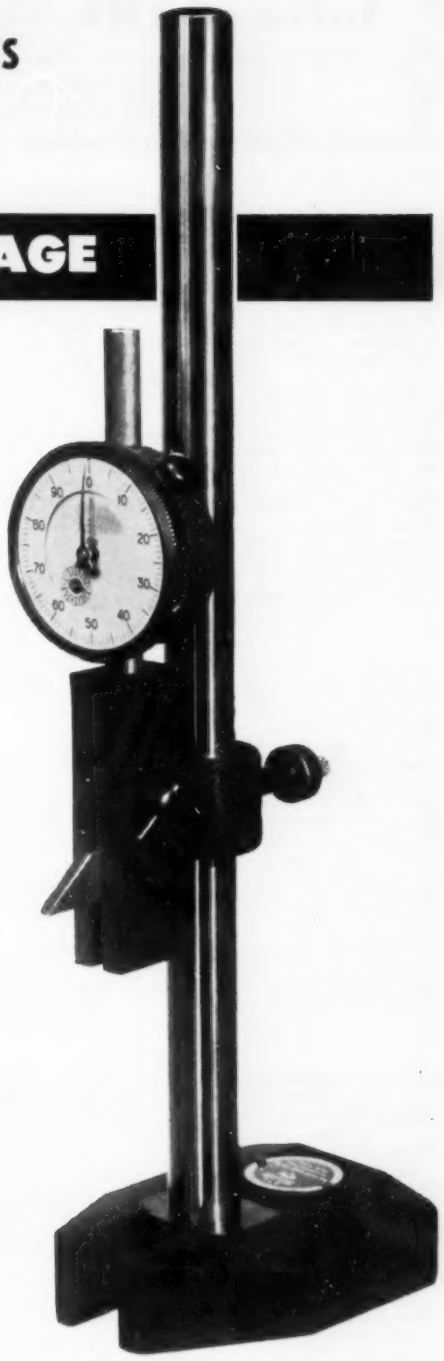
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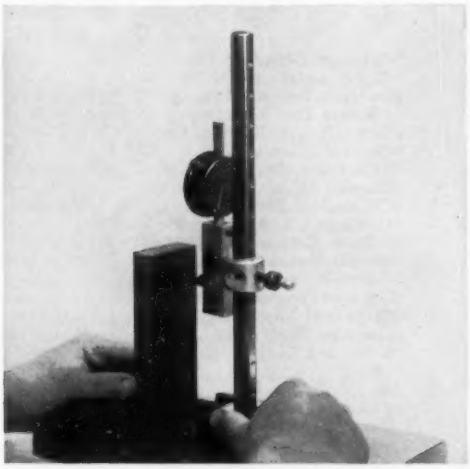
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# Index of THE TOOL ENGINEER Advertisers

**July 1956 Issue**

The Index to Advertisers is published as a reader service. Although every precaution is taken to assure correct listing, no allowance will be made for error or omission.

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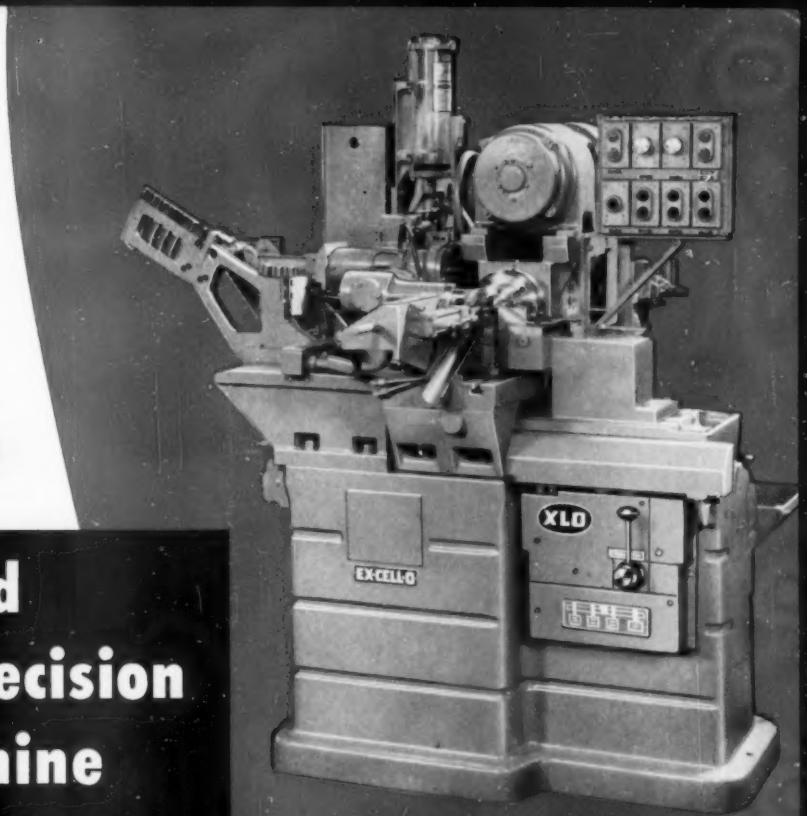
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## On a Standard Ex-Cell-O Precision Boring Machine



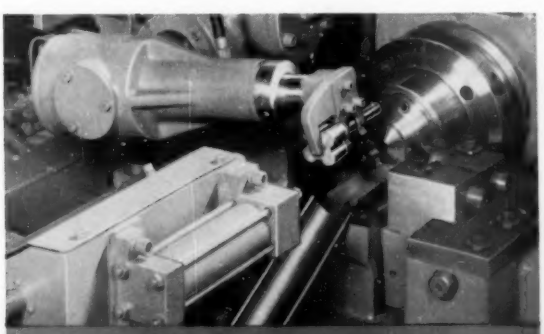

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The loading arm is about to load the part into the chuck. After machining, part is ejected into chute in foreground.



In straddle facing oil pump impellers (at right) smooth machine performance is imperative. Width limits between faces are held to .0005".

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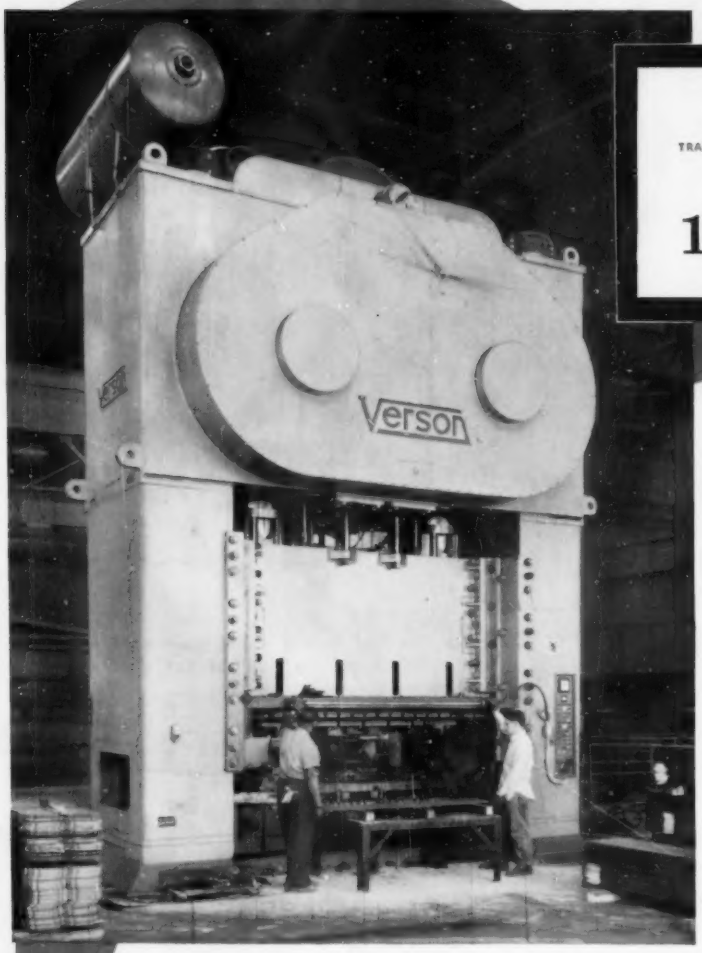
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56-17

# Front to Back Crank Arrangement of this

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